

Storm Water Management Plan For Priority Projects (Major SWMP)

Project Name:	Donahue Drive
Permit Number (Land Development Projects):	TM- 5518
Work Authorization Number (CIP):	
Applicant:	Hanna Maria L.L.C.
Applicant's Address:	1530 Jamacha Rd. Suite "Z" El Cajon, CA. 92019
Plan Prepare By (<i>Leave blank if same as applicant</i>):	K&S Engineering INC.
Date:	October 1, 2007
Revision Date (If applicable):	

The County of San Diego Watershed Protection, Storm Water Management, and Discharge Control Ordinance (WPO) (Ordinance No. 9424) requires all applications for a permit or approval associated with a Land Disturbance Activity must be accompanied by a Storm Water Management Plan (SWMP) (section 67.804.f). The purpose of the SWMP is to describe how the project will minimize the short and long-term impacts on receiving water quality. Projects that meet the criteria for a priority project are required to prepare a Major SWMP.

Since the SWMP is a living document, revisions may be necessary during various stages of approval by the County. Please provide the approval information requested below.

Project Review Stage	Does the SWMP need revisions?		If YES, Provide Revision Date
	YES	NO	
One Stage		✓	

Instructions for a Major SWMP can be downloaded at <http://www.co.san-diego.ca.us/dpw/stormwater/susmp.html>.

Completion of the following checklist and attachments will fulfill the requirements of a Major SWMP for the project listed above.

PROJECT DESCRIPTION

Please provide a brief description of the project in the following box. For example:

The 50-acre RC Ranch project is located on the south side of San Miguel Road in the County of San Diego (See Attachment 1). The project is approximately 1.0 mile east of the intersection of San Miguel Avenue and San Miguel Road and 1 mile south of the Sweetwater Reservoir. This project will consist of a planned residential community comprising of 45 single-family homes 72 and multi-unit dwellings.

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The project proposes a minor subdivision of 4.12 gross acres into 7 residential parcels ranging from 0.50 to 0.55 net acres and an impervious area of approx. 0.45 acres ($\pm 10.9\%$ of the project area site area) that will accommodate the private street. The subdivision is located on Donahue St. corner of Hillsdale Rd. in the Community of Cottonwood. Existing Land Use according to Zoning Regulations is considered Single Family Residence as well as the surrounding land.

PRIORITY PROJECT DETERMINATION

Please check the box that best describes the project. Does the project meet one of the following criteria?

PRIORITY PROJECT	YES	NO
Redevelopment within the County Urban Area that creates or adds at least 5,000 net square feet of additional impervious surface area	✓	
Residential development of more than 10 units		✓
Commercial developments with a land area for development of greater than 100,000 square feet		✓
Automotive repair shops		✓
Restaurants, where the land area for development is greater than 5,000 square feet		✓
Hillside development, in an area with known erosive soil conditions, where there will be grading on any natural slope that is twenty-five percent or greater, if the development creates 5,000 square feet or more of impervious surface		✓
Environmentally Sensitive Areas: All development and redevelopment located within or directly adjacent to or discharging directly to an environmentally sensitive area (where discharges from the development or redevelopment will enter receiving waters within the environmentally sensitive area), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition.		✓
Parking Lots 5,000 square feet or more or with 15 parking spaces or more and potentially exposed to urban runoff		✓
Streets, roads, highways, and freeways which would create a new paved surface that is 5,000 square feet or greater	✓	

Limited Exclusion: Trenching and resurfacing work associated with utility projects are not considered priority projects. Parking lots, buildings and other structures associated with utility projects are subject to SUSMP requirements if one or more of the criteria above are met.

If you answered **NO** to all the questions, then **STOP**. Please complete a Minor SWMP for your project.

If you answered **YES** to any of the questions, please continue.

The following questions provide a guide to collecting information relevant to project stormwater quality issues. Please provide a description of the findings in text box below.

	QUESTIONS	COMPLETED	NA
1.	Describe the topography of the project area.		
2.	Describe the local land use within the project area and adjacent areas.	Residential	
3.	Evaluate the presence of dry weather flow.		
4.	Determine the receiving waters that may be affected by the project throughout the project life cycle (i.e., construction, maintenance and operation).	Sweetwater River	
5.	For the project limits, list the 303(d) impaired receiving water bodies and their constituents of concern.	San Diego Bay/ Coliform Bacteria	
6.	Determine if there are any High Risk Areas (municipal or domestic water supply reservoirs or groundwater percolation facilities) within the project limits.	No	
7.	Determine the Regional Board special requirements, including TMDLs, effluent limits, etc.	N/A	
8.	Determine the general climate of the project area. Identify annual rainfall and rainfall intensity curves.	Average annual Rainfall is 13".	
9.	If considering Treatment BMPs, determine the soil classification, permeability, erodibility, and depth to groundwater.		
10.	Determine contaminated or hazardous soils within the project area.	N/A	

Please provide a description of the findings in the following box. For example:

The project is located in the San Diego Hydrologic unit. The area is characterized by rolling grassy hills and shrubs. Runoff from the project drains into a MS4 that eventually drains to Los Coches Creek. Within the project limit there are no 303(d) impaired receiving water and no Regional Board special requirements.

The Donahue subdivision project is located in the Sweetwater Watershed, and in the Middle Sweetwater hydrologic sub-area unit (909.20). The project area is characterized by moderately sloping land, previously mass graded. The drainage for this project will eventually flows into the Sweetwater River to the Pacific Ocean.
Project represents 0.001% of the Sweetwater Hydrological sub area (3.56 acres of proposed land / 265 600 acres of Sweetwater hydrologic basin*100 = 0.001%).
The proposed project will not alter the overall drainage pattern at the outfall of the drainage system. A modest increase in impervious area will be experienced by the project development.
According to the County of San Diego Hydrology Manual, April 1993 the existing and proposed conditions are considered Single Family Residence. Therefore, there is no increase in the Runoff Coefficient.

Complete the checklist below to determine if Treatment Best Management Practices (BMPs) are required for the project.

No.	CRITERIA	YES	NO	INFORMATION
1.	Is this an emergency project		✓	If YES, go to 6. If NO, continue to 2.
2.	Have TMDLs been established		✓	If YES, go to 5.

No.	CRITERIA	YES	NO	INFORMATION
	for surface waters within the project limit?		✓	If NO, continue to 3.
3.	Will the project directly discharge to a 303(d) impaired receiving water body?		✓	If YES, go to 5. If NO, continue to 4.
4.	Is this project within the urban and environmentally sensitive areas as defined on the maps in Appendix B of the <i>County of San Diego Standard Urban Storm Water Mitigation Plan for Land Development and Public Improvement Projects</i> ?	✓		If YES, continue to 5. If NO, go to 6.
5.	Consider approved Treatment BMPs for the project.	✓		If YES, go to 7.
6.	Project is not required to consider Treatment BMPs			Document for Project Files by referencing this checklist.
7.	End			

Now that the need for a treatment BMPs has been determined, other information is needed to complete the SWMP.

WATERSHED

Please check the watershed(s) for the project.

San Juan	Santa Margarita	San Luis Rey	Carlsbad
San Dieguito	Penasquitos	San Diego	Pueblo San Diego
✓ Sweetwater	Otay	Tijuana	

Please provide the hydrologic sub-area and number(s)

Number	Name
909.22	Middle Sweet Water (Hillsdale)
909.21	Jamacha.

Please provide the beneficial uses for Inland Surface Waters and Ground Waters. Beneficial Uses can be obtained from the Water Quality Control Plan For The San Diego Basin, which is available at the Regional Board office or at <http://www.swrcb.ca.gov/rwqcb9/programs/basinplan.html>.

SURFACE WATERS	Hydrologic Unit Basin Number	MUN	AGR	IND	PROC	GWR	FRESH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Inland Surface Waters																
Sweetwater River		✓	✓	✓	✓				✓	✓		✓		✓		
Ground Waters																
Middle Sweetwater		✓	✓	✓												

X Existing Beneficial Use

0 Potential Beneficial Use

* Excepted from Municipal

POLLUTANTS OF CONCERN

Using Table 1, identify pollutants that are anticipated to be generated from the proposed priority project categories. Pollutants associated with any hazardous material sites that have been remediated or are not threatened by the proposed project are not considered a pollutant of concern.

Table 1. Anticipated and Potential Pollutants Generated by Land Use Type

	<i>General Pollutant Categories</i>								
Priority Project Categories	Sediments	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides
Detached Residential Development	X	X			X	X	X	X	X
Attached Residential Development	X	X			X	P ⁽¹⁾	P ⁽²⁾	P	X
Commercial Development >100,000 ft ²	P ⁽¹⁾	P ⁽¹⁾		P ⁽²⁾	X	P ⁽⁵⁾	X	P ⁽³⁾	P ⁽⁵⁾
Automotive Repair Shops			X	X ⁽⁴⁾⁽⁵⁾	X		X		
Restaurants					X	X	X	X	
Hillside Development >5,000 ft ²	X	X			X	X	X		X

	General Pollutant Categories								
Priority Project Categories	Sediments	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides
Parking Lots	P ⁽¹⁾	P ⁽¹⁾	X		X	P ⁽¹⁾	X		P ⁽¹⁾
Streets, Highways & Freeways	X	P ⁽¹⁾	X	X ⁽⁴⁾	X	P ⁽⁵⁾	X		
X = anticipated P = potential (1) A potential pollutant if landscaping exists on-site. (2) A potential pollutant if the project includes uncovered parking areas. (3) A potential pollutant if land use involves food or animal waste products. (4) Including petroleum hydrocarbons. (5) Including solvents.									

Note: If other monitoring data that is relevant to the project is available. Please include as Attachment C.

CONSTRUCTION BMPs

Please check the construction BMPs that may be used. The BMPs selected are those that will be implemented during construction of the project. The applicant is responsible for the placement and maintenance of the BMPs selected.

- | | |
|---|----------------------------------|
| ✓ Silt Fence | Desilting Basin |
| ✓ Fiber Rolls | ✓ Gravel Bag Berm |
| ✓ Street Sweeping and Vacuuming | Sandbag Barrier |
| ✓ Storm Drain Inlet Protection | ✓ Material Delivery and Storage |
| ✓ Stockpile Management | ✓ Spill Prevention and Control |
| ✓ Solid Waste Management | ✓ Concrete Waste Management |
| ✓ Stabilized Construction Entrance/Exit | Water Conservation Practices |
| Dewatering Operations | ✓ Paving and Grinding Operations |
| ✓ Vehicle and Equipment Maintenance | |

Any minor slopes created incidental to construction and not subject to a major or minor grading permit shall be protected by covering with plastic or tarp prior to a rain event, and shall have vegetative cover reestablished within 180 days of completion of the slope and prior to final building approval.

SITE DESIGN

To minimize stormwater impacts, site design measures must be addressed. The following checklist provides options for avoiding or reducing potential impacts during project planning. If

YES is checked, it is assumed that the measure was used for this project. If NO is checked, please provide a brief explanation why the option was not selected in the text box below.

	OPTIONS	YES	NO	N/A
1.	Can the project be relocated or realigned to avoid/reduce impacts to receiving waters or to increase the preservation of critical (or problematic) areas such as floodplains, steep slopes, wetlands, and areas with erosive or unstable soil conditions?	✓		
2.	Can the project be designed to minimize impervious footprint?	✓		
3.	Conserve natural areas where feasible?	✓		
4.	Where landscape is proposed, can rooftops, impervious sidewalks, walkways, trails and patios be drained into adjacent landscaping?	✓		
5.	For roadway projects, can structures and bridges be designed or located to reduce work in live streams and minimize construction impacts?	✓		
6.	Can any of the following methods be utilized to minimize erosion from slopes:			
	6.a. Disturbing existing slopes only when necessary?	✓		
	6.b. Minimize cut and fill areas to reduce slope lengths?	✓		
	6.c. Incorporating retaining walls to reduce steepness of slopes or to shorten slopes?	✓		
	6.d. Providing benches or terraces on high cut and fill slopes to reduce concentration of flows?	✓		
	6.e. Rounding and shaping slopes to reduce concentrated flow?	✓		
	6.f. Collecting concentrated flows in stabilized drains and channels?	✓		

Please provide a brief explanation for each option that was checked N/A or NO in the following box.

If the project includes work in channels, then complete the following checklist. Information shall be obtained from the project drainage report.

No.	CRITERIA	YES	NO	N/A	COMMENTS
1.	Will the project increase velocity or volume of downstream flow?		✓		If YES go to 5.
2.	Will the project discharge to unlined channels?		✓		If YES go to 5.
3.	Will the project increase potential sediment load		✓		If YES go to 5.

No.	CRITERIA	YES	NO	N/A	COMMENTS
	of downstream flow?				
4.	Will the project encroach, cross, realign, or cause other hydraulic changes to a stream that may affect upstream and/or downstream channel stability?		✓		If YES go to 7.
5.	Review channel lining materials and design for stream bank erosion.		✓		Continue to 6.
6.	Consider channel erosion control measures within the project limits as well as downstream. Consider scour velocity.		✓		Continue to 7.
7.	Include, where appropriate, energy dissipation devices at culverts.		✓		Continue to 8.
8.	Ensure all transitions between culvert outlets/headwalls/wingwalls and channels are smooth to reduce turbulence and scour.		✓		Continue to 9.
9.	Include, if appropriate, detention facilities to reduce peak discharges.		✓		
10.	“Hardening“ natural downstream areas to prevent erosion is not an acceptable technique for protecting channel slopes, unless pre-development conditions are determined to be so erosive that hardening would be required even in the absence of the proposed development.		✓		Continue to 11.
11.	Provide other design principles that are comparable and equally effective.		✓		Continue to 12.
12.	End				

SOURCE CONTROL

Please complete the following checklist for Source Control BMPs. If the BMP is not applicable for this project, then check N/A only at the main category.

BMP			YES	NO	N/A
1.	Provide Storm Drain System Stenciling and Signage				
	1.a.	All storm drain inlets and catch basins within the project area shall have a stencil or tile placed with prohibitive language (such as: “NO DUMPING – DRAINS TO _____”) and/or graphical icons to discourage illegal dumping.	✓		
	1.b.	Signs and prohibitive language and/or graphical icons, which prohibit illegal dumping, must be posted at public access points along channels and creeks within the project area.	✓		
2.	Design Outdoors Material Storage Areas to Reduce Pollution Introduction				
	2.a.	This is a detached single-family residential project. Therefore, personal storage areas are exempt from this requirement.	✓		

BMP			YES	NO	N/A
	2.b.	Hazardous materials with the potential to contaminate urban runoff shall either be: (1) placed in an enclosure such as, but not limited to, a cabinet, shed, or similar structure that prevents contact with runoff or spillage to the storm water conveyance system; or (2) protected by secondary containment structures such as berms, dikes, or curbs.	✓		
	2.c.	The storage area shall be paved and sufficiently impervious to contain leaks and spills.	✓		
	2.d.	The storage area shall have a roof or awning to minimize direct precipitation within the secondary containment area.	✓		
3.	Design Trash Storage Areas to Reduce Pollution Introduction				
	3.a.	Paved with an impervious surface, designed not to allow run-on from adjoining areas, screened or walled to prevent off-site transport of trash; or,	✓		
	3.b.	Provide attached lids on all trash containers that exclude rain, or roof or awning to minimize direct precipitation.	✓		
4.	Use Efficient Irrigation Systems & Landscape Design				
	The following methods to reduce excessive irrigation runoff shall be considered, and incorporated and implemented where determined applicable and feasible.				
	4.a.	Employing rain shutoff devices to prevent irrigation after precipitation.	✓		
	4.b.	Designing irrigation systems to each landscape area's specific water requirements.	✓		
	4.c.	Using flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.	✓		
	4.d.	Employing other comparable, equally effective, methods to reduce irrigation water runoff.	✓		
5.	Private Roads				✓
	The design of private roadway drainage shall use at least one of the following				
	5.a.	Rural swale system: street sheet flows to vegetated swale or gravel shoulder, curbs at street corners, culverts under driveways and street crossings.			
	5.b.	Urban curb/swale system: street slopes to curb, periodic swale inlets drain to vegetated swale/biofilter.			
	5.c.	Dual drainage system: First flush captured in street catch basins and discharged to adjacent vegetated swale or gravel shoulder, high flows connect directly to storm water conveyance system.			
	5.d.	Other methods that are comparable and equally effective within the project.			
6.	Residential Driveways & Guest Parking				
	The design of driveways and private residential parking areas shall use one at least of the following features.				
	6.a.	Design driveways with shared access, flared (single lane at street) or wheelstrips (paving only under tires); or, drain into landscaping prior to discharging to the storm water conveyance system.	✓		
	6.b.	Uncovered temporary or guest parking on private residential lots may be: paved with a permeable surface; or, designed to drain into landscaping prior to discharging to the storm water conveyance system.			✓
	6.c.	Other features which are comparable and equally effective.			
7.	Dock Areas				✓

BMP		YES	NO	N/A
	Loading/unloading dock areas shall include the following.			
7.a.	Cover loading dock areas, or design drainage to preclude urban run-on and runoff.			
7.b.	Direct connections to storm drains from depressed loading docks (truck wells) are prohibited.			
7.c.	Other features which are comparable and equally effective.			
8.	Maintenance Bays			✓
	Maintenance bays shall include the following.			
8.a.	Repair/maintenance bays shall be indoors; or, designed to preclude urban run-on and runoff.			
8.b.	Design a repair/maintenance bay drainage system to capture all wash water, leaks and spills. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.			
8.c.	Other features which are comparable and equally effective.			
9.	Vehicle Wash Areas			✓
	Priority projects that include areas for washing/steam cleaning of vehicles shall use the following.			
9.a.	Self-contained; or covered with a roof or overhang.			
9.b.	Equipped with a clarifier or other pretreatment facility.			
9.c.	Properly connected to a sanitary sewer.			
9.d.	Other features which are comparable and equally effective.			
10.	Outdoor Processing Areas			✓
	Outdoor process equipment operations, such as rock grinding or crushing, painting or coating, grinding or sanding, degreasing or parts cleaning, waste piles, and wastewater and solid waste treatment and disposal, and other operations determined to be a potential threat to water quality by the County shall adhere to the following requirements.			
10.a.	Cover or enclose areas that would be the most significant source of pollutants; or, slope the area toward a dead-end sump; or, discharge to the sanitary sewer system following appropriate treatment in accordance with conditions established by the applicable sewer agency.			
10.b.	Grade or berm area to prevent run-on from surrounding areas.			
10.c.	Installation of storm drains in areas of equipment repair is prohibited.			
10.d.	Other features which are comparable or equally effective.			
11.	Equipment Wash Areas			✓
	Outdoor equipment/accessory washing and steam cleaning activities shall be.			
11.a.	Be self-contained; or covered with a roof or overhang.			
11.b.	Be equipped with a clarifier, grease trap or other pretreatment facility, as appropriate			
11.c.	Be properly connected to a sanitary sewer.			
11.d.	Other features which are comparable or equally effective.			
12.	Parking Areas			✓
	The following design concepts shall be considered, and incorporated and implemented where determined applicable and feasible by the County.			
12.a.	Where landscaping is proposed in parking areas, incorporate landscape areas into the drainage design.			

BMP			YES	NO	N/A
	12.b.	Overflow parking (parking stalls provided in excess of the County's minimum parking requirements) may be constructed with permeable paving.			
	12.c.	Other design concepts that are comparable and equally effective.			
13.	Fueling Area				✓
	Non-retail fuel dispensing areas shall contain the following.				
	13.a.	Overhanging roof structure or canopy. The cover's minimum dimensions must be equal to or greater than the area within the grade break. The cover must not drain onto the fuel dispensing area and the downspouts must be routed to prevent drainage across the fueling area. The fueling area shall drain to the project's treatment control BMP(s) prior to discharging to the storm water conveyance system.			
	13.b.	Paved with Portland cement concrete (or equivalent smooth impervious surface). The use of asphalt concrete shall be prohibited.			
	13.c.	Have an appropriate slope to prevent ponding, and must be separated from the rest of the site by a grade break that prevents run-on of urban runoff.			
	13.d.	At a minimum, the concrete fuel dispensing area must extend 6.5 feet (2.0 meters) from the corner of each fuel dispenser, or the length at which the hose and nozzle assembly may be operated plus 1 foot (0.3 meter), whichever is less.			

Please list other project specific Source Control BMPs in the following box. Write N/A if there are none and briefly explain.

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TREATMENT CONTROL

To select a structural treatment BMP using Treatment Control BMP Selection Matrix (Table 2), each priority project shall compare the list of pollutants for which the downstream receiving waters are impaired (if any), with the pollutants anticipated to be generated by the project (as identified in Table 1). Any pollutants identified by Table 1, which are also causing a Clean Water Act section 303(d) impairment of the receiving waters of the project, shall be considered primary pollutants of concern. Priority projects that are anticipated to generate a primary pollutant of concern shall select a single or combination of stormwater BMPs from Table 2, which **maximizes pollutant removal** for the particular primary pollutant(s) of concern.

Priority projects that are **not** anticipated to generate a pollutant for which the receiving water is Clean Water Act Section 303(d) impaired shall select a single or combination of stormwater BMPs from Table 2, which are effective for pollutant removal of the identified secondary pollutants of concern, consistent with the "maximum extent practicable" standard.

Table 2. Treatment Control BMP Selection Matrix

Pollutant of Concern	Treatment Control BMP Categories						
	Biofilters	Detention Basins	Infiltration Basins ⁽²⁾	Wet Ponds or Wetlands	Drainage Inserts	Filtration	Hydrodynamic Separator Systems ⁽³⁾
Sediment	M	H	H	H	L	H	M
Nutrients	L	M	M	M	L	M	L
Heavy Metals	M	M	M	H	L	H	L
Organic Compounds	U	U	U	M	L	M	L
Trash & Debris	L	H	U	H	M	H	M
Oxygen Demanding Substances	L	M	M	M	L	M	L
Bacteria	U	U	H	H	L	M	L
Oil & Grease	M	M	U	U	L	H	L
Pesticides	U	U	U	L	L	U	L
<p>(1) Copermittees are encouraged to periodically assess the performance characteristics of many of these BMPs to update this table.</p> <p>(2) Including trenches and porous pavement.</p> <p>(3) Also known as hydrodynamic devices and baffle boxes.</p> <p>L: Low removal efficiency: M: Medium removal efficiency: H: High removal efficiency: U: Unknown removal efficiency</p> <p>Sources: <i>Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters</i> (1993), <i>National Stormwater Best Management Practices Database</i> (2001), <i>Guide for BMP Selection in Urban Developed Areas</i> (2001), and <i>Caltrans New Technology Report</i> (2001).</p>							

A Treatment BMP must address runoff from developed areas. Please provide the post-construction water quality values for the project. Label outfalls on the BMP map. Q_{WQ} is dependent on the type of treatment BMP selected for the project.

Outfall	Tributary Area (acres)	Q_{100} (cfs)	Q_{WQ} (cfs)
Node 96	2.82	6.04	0.18
Node 86	1.89	0.99	0.04

Please check the box(s) that best describes the Treatment BMP(s) selected for this project.

Biofilters

- ✓ Grass swale
- ✓ Grass strip
- Wetland vegetation swale
- Bioretention

Detention Basins

- Extended/dry detention basin with grass lining
- Extended/dry detention basin with impervious lining

Infiltration Basins

Infiltration basin
 Infiltration trench
 Porous asphalt
 Porous concrete
 Porous modular concrete block

Wet Ponds or Wetlands

Wet pond/basin (permanent pool)
 Constructed wetland

Drainage Inserts (See note below)

Oil/Water separator
 Catch basin insert
 ✓ Storm drain inserts
 Catch basin screens

Filtration

Media filtration
 Sand filtration

Hydrodynamic Separator Systems

Swirl Concentrator
 Cyclone Separator
 Baffle Separator
 Gross Solids Removal Device
 Linear Radial Device

Note: Catch basin inserts and storm drain inserts are excluded from use on County maintained right-of-way and easements.

Include Treatment Datasheet as Attachment E. The datasheet should include the following:	COMPLETED	NO
1. Description of how treatment BMP was designed. Provide a description for each type of treatment BMP.	✓	
2. Engineering calculations for the BMP(s)	✓	

Please describe why the selected treatment BMP(s) was selected for this project. For projects utilizing a low performing BMP, please provide a detailed explanation and justification.

Post-construction runoff will be directed into a storm drain system. This system will not divert water from its natural outlet points. The preliminary design of this system is included in the BMP map. Bio-Clean Filter Units are proposed for nodes 85 and 96. Summaries of the post-construction water quality flows are included in Treatment Control section. The flows were developed using the 85th Percentile Precipitation map developed by the County, which was obtained from the website

MAINTENANCE

Please check the box that best describes the maintenance mechanism(s) for this project.

CATEGORY	SELECTED	
	YES	NO
First	✓	
Second		✓
Third	✓	
Fourth		✓

Please briefly describe the long-term fiscal resources for the selected maintenance mechanism(s).

First Category: Grass Swale, The County should have only minimal concern for ongoing maintenance. The proposed BMP's inherently "take care of themselves", or property owners can naturally be expected to do so as an incident of taking care of their property.

Third Category: Filtration Systems, The County needs to assure ongoing maintenance is heightened, to the point that the County is willing to take on this responsibility. A permanent funding mechanism needs to be establish.
See Attachment "F" for details.

ATTACHMENTS

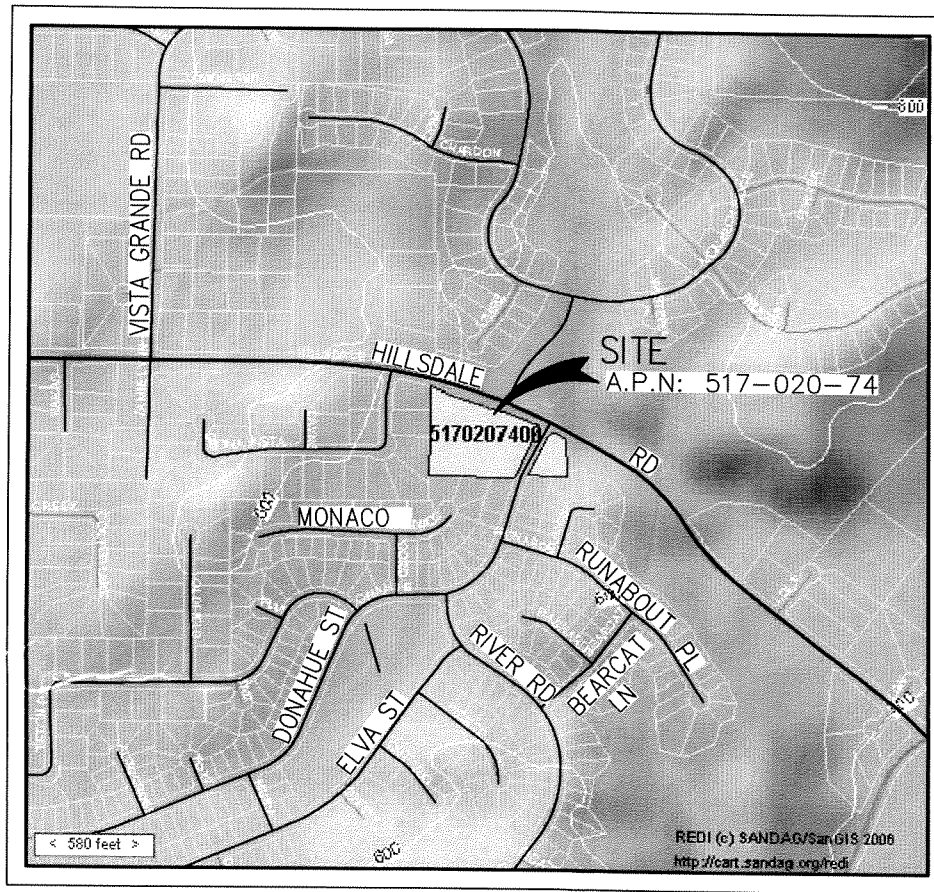
Please include the following attachments.

ATTACHMENT		COMPLETED	N/A
A	Project Location Map	✓	
B	Site Map	✓	
C	Relevant Monitoring Data		✓
D	Treatment BMP Location Map	✓	
E	Treatment BMP Datasheets	✓	
F	Operation and Maintenance Program for Treatment BMPs	✓	
G	Engineer's Certification Sheet	✓	

Note: Attachments A and B may be combined.

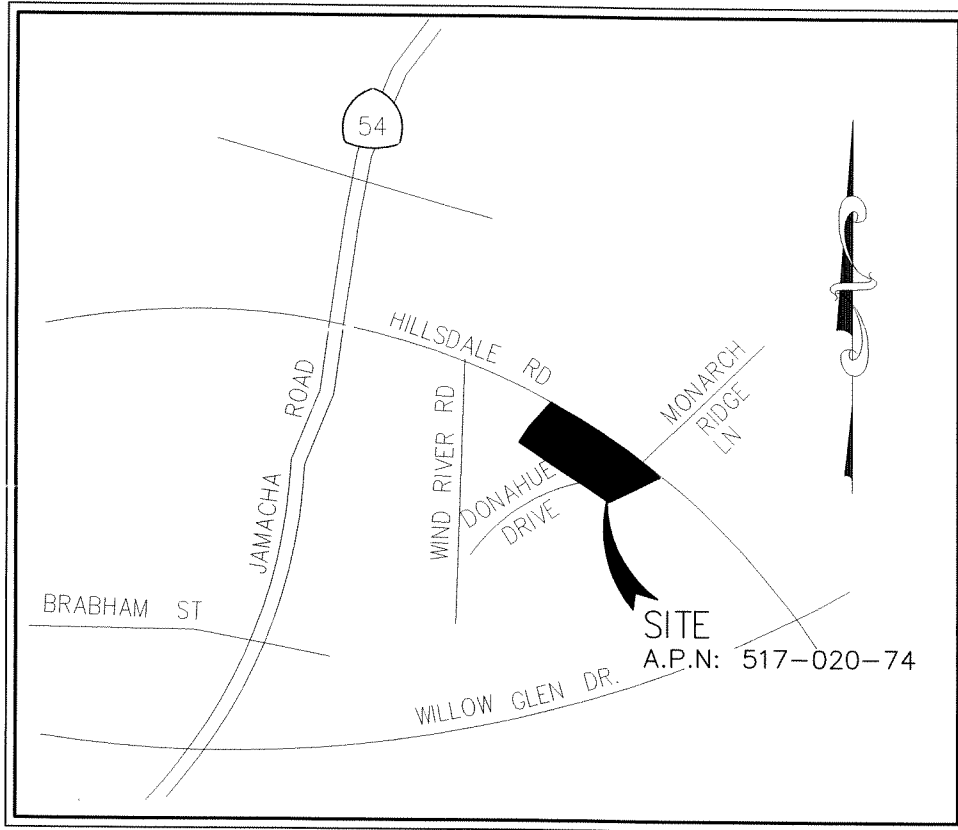
ATTACHMENT A

LOCATION MAP



LOCATION MAP

T.B.M. 1272- C3



VICINITY MAP

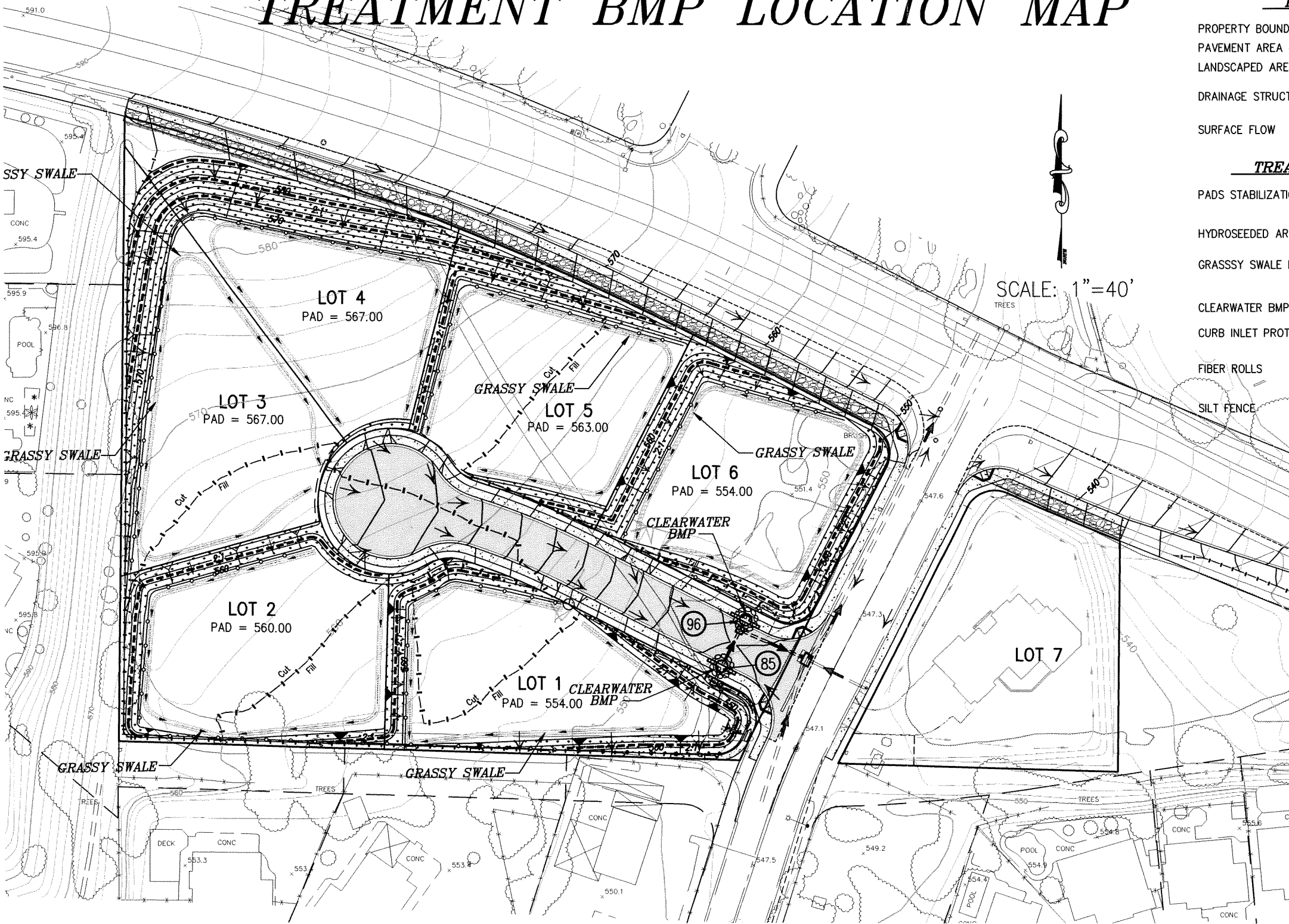
NOT TO SCALE

T.B.M. 1272- C3

ATTACHMENT B

PROJECT SITE MAP

TREATMENT BMP LOCATION MAP

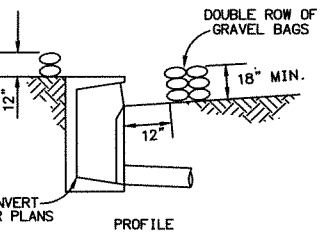
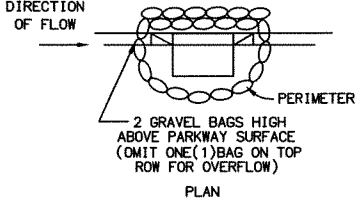
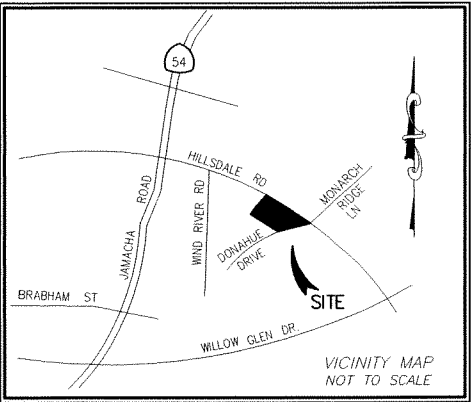


LEGEND

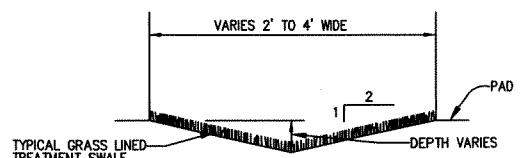
PROPERTY BOUNDARY
PAVEMENT AREA (CONC.-ASPH.)
LANDSCAPED AREA
DRAINAGE STRUCTURE FLOW
SURFACE FLOW

TREATMENT BMP's

PADS STABILIZATION OR BFM
HYDROSEEDING AREA
GRASSY SWALE BMP
CLEARWATER BMP
CURB INLET PROTECTION
FIBER ROLLS
SILT FENCE



INLET PROTECTION
N.T.S.



TYPICAL LOT TREATMENT
GRASSY SWALE BMP
NOT TO SCALE

TRIBUTORY AREAS FOR EACH UNIT			
OUTFALL NODE	ACRE	Q ₁₀ (CFS)	Q ₁ (CFS)
86	1.89	0.99	0.04
96	2.82	6.04	0.18

TIME OF INSTALLATION:
IT IS THE INTENT THAT THE HYDROSEED MIX BE APPLIED NO SOONER THAN JUST BEFORE THE FIRST RAIN, IN NOVEMBER, AND NO LATER THAN JUST AFTER THE SECOND RAIN AFTER THE FIRST RAIN IN NOV.

ENGINEER OF WORK
KAMAL S. SWEIS RCE 48592 DATE



K&S ENGINEERING
Planning Engineering Surveying
(619)296-5565 7801 Mission Center Court, Suite 100 San Diego Ca. 92108

BENCH MARK	
DESCRIPTION:	PHR 0004
LOCATION:	SOUTHWEST CORNER OF POST HILL ROAD & HIGHWAY 67.
RECORD FROM:	
ELEVATION:	496.66
DATUM:	NGVD29

PRIVATE CONTRACT

SHEET 1 COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS 1 SHEETS

TREATMENT BMP LOCATION MAP

SWMP MAP
DONAHUE STREET

Approved: COUNTY ENGINEER By: Engineer of work: Kamal S. Sweis R.C.E. 48592

Grading Permit No. _____

ATTACHMENT C

RELEVANT MONITORING DATA

(NOTE: PROVIDE RELEVANT WATER QUALITY MONITORING DATA IF AVAILABLE.)

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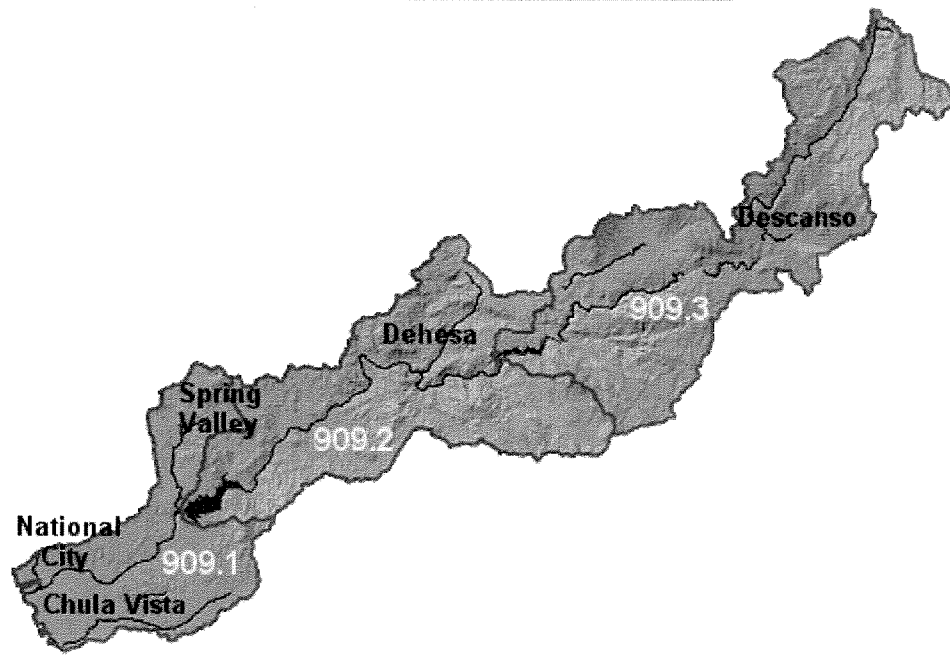
Sweetwater Watershed

Plan

Projects

Activities

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[Watersheds](#)
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[Santa Margarita](#)
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[Penasquillos](#)
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Hydrologic Unit 909.11 - 909.35

Hydrologic Areas:	Lower Sweetwater 909.1 Middle Sweetwater 909.2 Upper Sweetwater 909.3
Major Water Bodies:	Sweetwater River, Sweetwater Reservoir, Loveland Reservoir, and San Diego Bay
CWA 303(d) List:	San Diego Bay/ Telegraph: coliform bacteria
Major Impacts:	Surface and groundwater quality degradation, habitat degradation and loss, and invasive species
Constituents of Concern:	coliform bacteria, trace metals and other toxics
Sources / Activities:	agricultural and urban runoff

The Sweetwater River watershed along with the Otay and Pueblo San Diego watersheds combine to form the San Diego Bay watershed area. The Sweetwater River watershed is the largest of the three encompassing 230 of the approximately 415 square mile total. Over 86% of the watershed is within unincorporated jurisdictions. The dominant land uses in the Sweetwater River watershed are urban (29%), open space/ agriculture (22%), and undeveloped (49%). Approximately two-thirds of the land area categorized as urban is composed of residential communities. Approximately 300,000 people currently reside within the Sweetwater River watershed, and this

amount is projected to increase to 365,000 by 2015. The most important watershed issues are related to the protection of municipal water supplies, and the protection and restoration of sensitive wetland and wildlife habitats.

Between the headwaters and the outlet to San Diego Bay, the watershed contains a variety of habitat types including oak and pine woodlands, riparian forest, chaparral, coastal sage scrub, and coastal salt marsh. The upper watershed contains large undeveloped areas within the Cleveland National Forest and Cuyamaca Rancho State Park, the unincorporated communities of Pine Valley, Descanso, and Alpine, and the Viejas Indian Reservation. Unincorporated rural and suburban communities characterize the central part of the watershed. The urbanized lower portion of the Sweetwater watershed contains portions of several cities including San Diego, National City, Chula Vista, La Mesa, and Lemon Grove. Of the cities within the watershed, Chula Vista is the most important in terms of land area.

There are many beneficial water uses within the Sweetwater Watershed as designated in the State Water Resources Control Board's San Diego Region Basin Plan.



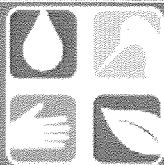
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Leadership, cooperation, and education are the most
important tools we have for compelling change.

PCW Webmaster

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Sweetwater Watershed

Beneficial Water Uses

Plan

Projects

Activities

[Return to Sweetwater Watershed page](#)

Beneficial water uses within the Sweetwater Watershed as designated in the State Water Resources Control Board's San Diego Region Basin Plan.

Planning Efforts

Watersheds

San Juan

Santa Margarita

San Luis Rey

Carlsbad

San Dieguito

Penasquitos

San Diego

Pueblo

Sweetwater

Olay

Tijuana

For Kids

Report Dumping

Search

Beneficial Uses	Inland Surface Water	Coastal Waters	Reservoirs and Lakes	Ground Water
Municipal and Domestic Supply	X		X	X
Agricultural Supply	X		X	X
Industrial Service Supply	X	X	X	X
Industrial Process Supply	X		X	
Navigation		X		
Contact Water Recreation	X	X	X	
Non-Contact Water Recreation	X	X	X	
Commercial and Sport Fishing		X		
Biological Habitats of Special Signif.	X	X		
Warm Freshwater Habitat	X		X	
Cold Freshwater Habitat	X		X	
Wildlife Habitat	X	X	X	
Rare, Threatened, or End.	X	X		
Marine Habitat		X		
Migration of Aquatic Organisms		X		
Estuarine Habitat		X		
Shellfish Harvesting		X		

Summary of beneficial use designations.

ATTACHMENT D

TREATMENT BMP LOCATION MAP

ATTACHMENT E

TREATMENT BMP DATASHEET

*(NOTE: POSSIBLE SOURCE FOR DATASHEETS CAN BE FOUND AT
WWW.CABMPHANDBOOKS.COM. INCLUDE ENGINEERING CALCULATIONS FOR SIZING THE
TREATMENT BMP.)*



**SOUTHERN CALIFORNIA WORLD WATER FORUM INNOVATIVE
CONSERVATION RESEARCH AND TECHNOLOGY GRANT PROGRAM**

**HYDRAULIC PERFORMANCE, POLLUTANT REMOVAL
EFFICIENCIES, AND ECONOMIC EVALUATION OF CATCH BASIN
INSERT DEVICES**

APRIL 2006

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www.usc.edu/dept/civil_eng/dept/index.html

EXECUTIVE SUMMARY

Stormwater pollution is a major problem in urban areas. The Stormwater pollution leads to deteriorated water quality in oceans, lakes, and rivers. This study was conducted to evaluate the hydraulic performance and pollutant removal potential of curb inlet devices.

Four different types of curb inlet devices were donated to the University of Southern California from Biocleanenvironmental Stormwatersystems, Stormwater360, and United Stormwater. The units were installed on McClintock Avenue inside the University Park Campus with the help of facilities management services at USC.

Trash was obtained from Los Angeles Sanitation Services and United Stormwater for the purpose of the study. The units were filled with trash to evaluate the hydraulic performance. The test was conducted by running water from water trucks onto the streets. The water then entered the devices at approximately 635 gallons per minute (gpm). The units were evaluated for pollutant removal potential by collecting water quality samples before it reached the unit and then from under the units at different time intervals. The samples were evaluated using chemical analysis to determine the water quality.

The water quality analysis results were documented and analyzed. It was found that the units reduce trash entering the drains. The report discusses issues with respect to the hydraulic performance of the devices at high flow rates. Maintenance of the units is another major concern that has a major impact on the total cost of this type of BMP. The report provides an economic analysis of the devices analyzed during this study.

ACKNOWLEDGEMENT

Funding for this project was provided through a grant from the Metropolitan Water District of Southern California. Helpful comments on development were provided by Dr. Dr. Jiin-Jen Lee, and the Water Resources group in the USC Civil and Environmental Engineering Department.

Facilities Management Services at USC was instrumental in providing access to Storm water catch basins on university park campus for the purpose of the study. I am grateful to Mr. Steven Wolverton for his cooperation and constant help during the period of this project.

The Manufacturers/Companies, Biocleanenvironmental, Stormwatersystems, Stormwater360 and United Stormwater were generous and donated their curb inlet devices for the purpose of this study. I am extremely grateful for their help in this regard.

I thank the Los Angeles Bureau of Sanitation, Watershed Protection Division for their input and help during the course of this study.

INTRODUCTION

Stormwater runoff is part of a natural hydrologic process. Rainwater and snowmelt run off the earth's surface and enter local surface drainage channels, swales, creeks, ponds, and reservoirs. Contaminated stormwater discharges have been increasingly identified as a significant source of water pollution. Stormwater runoff often carries pollution from created through human activities.

Stormwater pollution degrades the quality of surface and ground water resources. This type of pollution is usually referred to as non-point source pollution because it has no single discharge point into a stormwater collection system or into surface waters. A variety of activities cause nonpoint pollution: driving on roads, fertilizing lawns and agricultural land, plowing farm fields, constructing buildings and roads, and removing snow from streets and highways. The more land people develop for housing, schools, business, and industry, the more awareness is needed on what is required to control stormwater runoff and its accompanying pollution.

Two hundred years of unregulated, unmanaged stormwater have contributed to many severe public health problems and expensive natural resource losses in the United States. Unregulated and uncontrolled Stormwater have been found to have the following consequences:

- pollutes drinking water sources by filling in reservoirs with clogging silt and oxygen-robbing nutrients which contributes to drinking water emergencies;
- fills in navigable waterways with contaminated sediment, resulting in increased dredging and spoil disposal costs;
- closes or shrinks lucrative rockfish, shad, flounder, crab, oyster, and other commercial fisheries due to chemical contamination, oxygen starvation, and the resulting loss of habitat;

- fouls beaches and other recreational waters, causing losses in revenues from declines in boating, fishing, duck hunting, and coastal tourism;
- scours smaller stream channels and dumps huge gravel and silt loads, ruining fish and amphibian habitat;
- obliterates small streams, springs and wetlands during development (these natural water bodies are sources of clean ground and surface water and serve as habitat for aquatic life); and
- damages homes and businesses during the flash floods common where stormwater is left uncontrolled

[Source: National Resource Defense Council, NRDC]

This report reviews current stormwater pollution problems in Los Angeles as it relates to curb inlet devices. The report provides information relative to the hydraulic performance of the curb inlet devices tested during this study. The report also discusses the evaluation of pollutant removal potential of the curb inlet devices. The economic analysis related to the installation and maintenance of curb inlet devices in the Los Angeles area are also provided in the report.

The Objectives of the present study are:

- To review current Stormwater pollution problem in Los Angeles
- To evaluate hydraulic performance of the curb inlet devices
- To evaluate pollutant removal potential of curb inlet devices

LITERATURE REVIEW

Stormwater Quality in Los Angeles

With nearly 10 million people living in Los Angeles County, each resident's contribution to stormwater pollution adds up quickly to create a serious public health situation. In a 1997 study conducted by Pelegrin Research Group, an estimate of the number of times per month that Los Angeles County residents engage in polluting activities was established. This type of study is known as pollution volumetrics. According to an updated 2001 study, it is conservatively estimated that each month in Los Angeles County, residents contribute to stormwater pollution by:

- Dropping cigarette butts on the ground nearly 915,000 times
- Dropping litter on the ground or out a car window more than 830,000 times
- Allowing paper or trash to blow into the street more than 800,000 times
- Throwing something in the gutter or down a storm drain nearly 280,000 times
- Emptying a car ashtray into the street more than 40,000 times
- Hosing leaves or dirt off a driveway or sidewalk into the street nearly 420,000 times
- Washing off paint brushes under an outdoor faucet more than 130,000 times
- Spraying the garden or lawn with pesticide more than 210,000 times
- Walking a dog without picking up the droppings more than 82,000 times

Also, in Los Angeles County, approximately 100 million gallons of contaminated water and debris drain through the storm drain system each dry day. That would fill the Rose Bowl 1.2 times. On rainy days, the daily flow can increase to 10 billion gallons per day.

[Source: State Water Resources Control Board, SWRCB]

A study conducted by the Santa Monica Bay Restoration Project found that stormwater pollution in the ocean leads to increased risk of viral infections, earaches, sinus problems, fever, flu and skin rashes and viral diseases for those swimming in the ocean close to storm drain outfalls. This is especially true following a rainstorm, when litter and contaminants are flushed into the storm drain system. The Los Angeles County Department of Health Services recognizes the increased health danger associated with stormwater pollution. They have a standing rain advisory that "recommends that beach users avoid contact with ocean water, especially near flowing storm drains, creeks and rivers for a period of 3 days after rainfall ends." Heal the Bay's 2002-2003 Annual Beach Report Card on the health of Los Angeles County's beaches gave 56 percent of monitored beaches a failing grade during wet weather. This means the conditions were hazardous to human health and would have adverse health effects to swimmers who enter the water. When bacteria levels exceed the State Standards, a warning sign is posted and swimmers are encouraged not to enter the water.

Stormwater contaminants are one of the main causes of increased bacteria levels at local beaches. During 2002, there were 269 warnings posted on Los Angeles County beaches for a total of 1,181 days where the ocean was too polluted for human use. Each month in Los Angeles County, residents drop their cigarette butts on the ground more than 915,000 times. These cigarette butts pose imminent risks to child health and safety including the risk of swallowing, choking or burning themselves with discarded, toxin-laden butts. Research conducted by regional agencies, respected environmental non-profit organizations, and academic institutions have identified stormwater pollution and urban runoff as the leading sources of pollutants to Los Angeles County's inland rivers, creeks, the ocean and beaches along the area's coastline. The widespread critical issue has reached a level that has prompted local, state, and federal policymakers and regulatory agencies to enact and enforce more

stringent stormwater permit regulations, financial penalties, and other compliance measures.

Beach attendance has dropped by 56 percent since 1983. The recreation and tourism industry is one of the top employers in the nation, and is a particularly valuable part of the Los Angeles coastal economy. Each year, Americans take more than 1.8 billion trips to water destinations, largely for recreation. This recreation creates jobs. Activities related to the county's \$2 billion annual tourism industry depend largely on the access and enjoyment of clean waters. If the popular perception is that beaches are deteriorating, it poses broader implications for the region's financial growth. When storm drains become clogged with trash and debris, it can result in street and neighborhood flooding during the rainy season. This water backup can lead to closed roads and increased traffic. It also creates an unhealthy environment of smelly and unsanitary conditions in communities which worsens local aesthetics and lowers property values. The cleanliness of communities has an impact on the financial and personal investment residents make in their property. Cleanliness also contributes to the overall sense of community pride and civic engagement.



Figure 1: Image showing accumulation of trash on the beach



Figure 2: Image showing various materials found accumulated on the beach due to stormwater pollution [Source: www.goldenstateimages.com]



Figure 3: Picture taken near Venice beach of resident pouring oil into storm drain



Figure 4: Picture taken of a catch basin in the vicinity of Venice beach



Figure 5: Picture showing the amount trash on the streets and sidewalks that eventually lead its way in storm drains during runoffs and finally to the water bodies

[Source: Bureau of Sanitation, Watershed Protection Division, Trash study Project]

Characterization of Stormwater Pollutants

The first step in targeting outreach dealing with Stormwater management is determining the pollutants that pose the greatest threat to water quality. This effort requires an analysis of water quality data and reconciling this information across watersheds if the jurisdiction covers more than one watershed. The City of Los Angeles lies within three primary watersheds and a multitude of sub-watersheds. The three primary watersheds, Los Angeles river watershed, Ballona creek watershed and Dominguez watershed, are mostly within an urban environment. However, at the sub-watershed level, there were vast differences in the environment. After results were evaluated, it was found that the main pollutants are:

- Bacteria/Pathogens
- Pesticides
- PAHs (Poly Aromatic Hydrocarbons)
- Nutrients
- Trash and Debris

For the purpose of this study, the main focus is on removal of trash and debris that accumulate in the stormwater catch basins. After a considerable amount of research and field observation, the trash and debris were characterized for the City of Los Angeles.

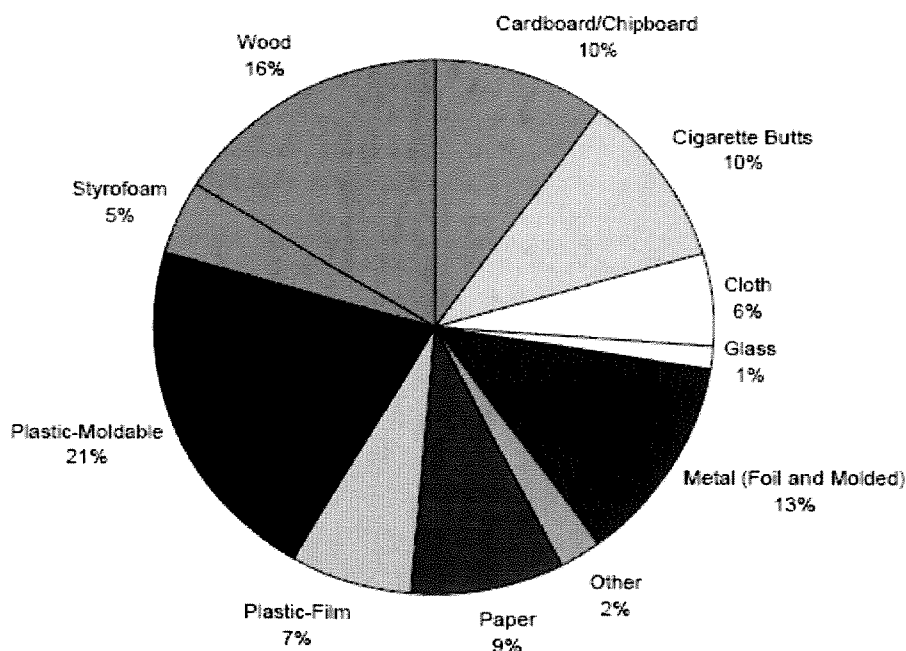


Figure 6: Characteristics of Trash [Source: California Department of Transportation (June 2000) District 7 Litter Management Pilot Study]

Stormwater Pollution Mitigation Measures

The California Water Resources Regional Board adopted waste discharge requirements for municipal stormwater and urban runoff discharges within the county of Los Angeles on July 15, 1996. These requirements prohibit non-stormwater discharges to storm drain systems unless they are covered by separate NPDES permits. This prohibition, in general, does not apply to rising groundwater, uncontaminated groundwater infiltration discharges, discharges from potable water sources, foundation and footing drains discharges, and water from crawl space pumps. The municipality may allow discharge of these types of discharges into the storm drain system. However, the municipality or the Regional Board may prohibit these discharges if they are determined to cause, or threaten to cause, degradation of water quality, violation of water quality objectives, nuisance and/or impair beneficial uses of receiving waters. Effluent discharge limitations are presented in Appendix A.

Best Management Practices (BMPs)

Over a period of time, many BMPs have come into practice to control water quality deterioration resulting from stormwater pollution. Several BMPs include the trash production prevention through public education, using physical devices at the source to prevent trash entry into storm drains, end of pipe collection systems, hydrodynamic devices, Wetlands programs etc... Below is a pictorial representation of some of the BMPs.

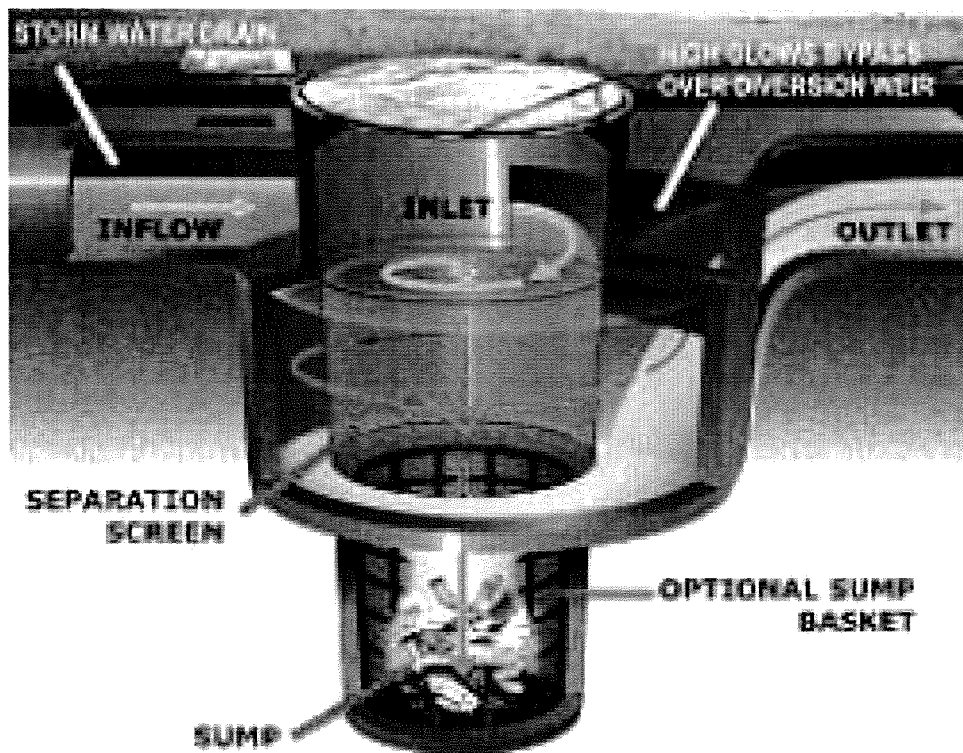


Figure 7: Hydrodynamic device (Continuous Deflective Systems, CDS)
These devices use the storm flows energy to create a vortex, much like a centrifuge, that separates the solids/trash, which then fall to the sump at the bottom of the structure.

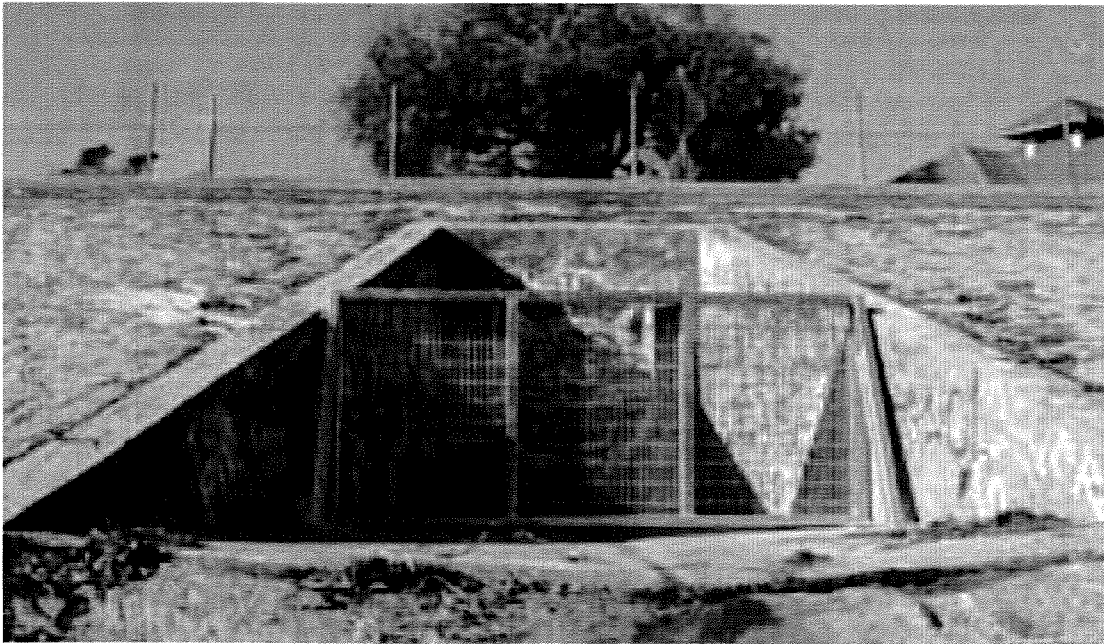


Figure 8: Trash Barrier at the End of pipe entering the river [Source: Bureau of Sanitation, Watershed Protection Division, Trash study Project]

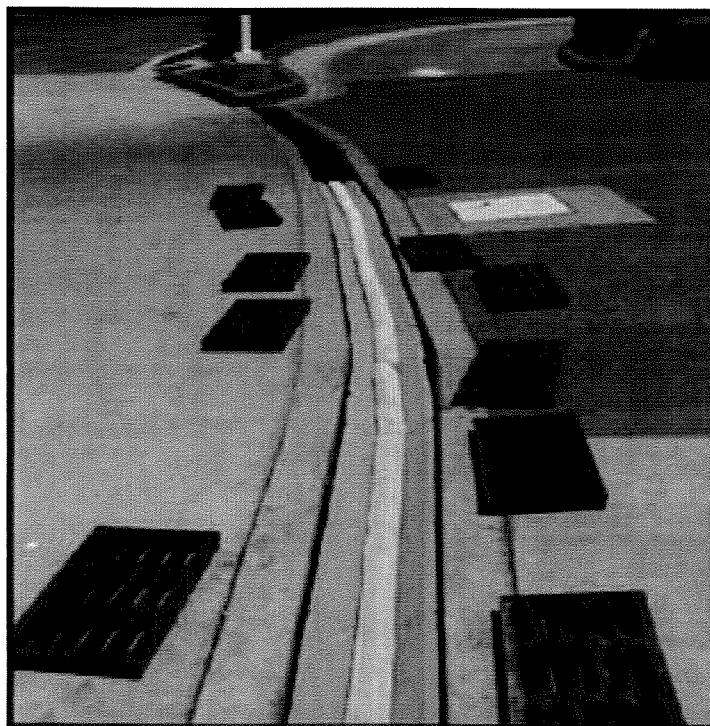


Figure 9: Trench Drain Filters [Source: Bioclenenvironmental]

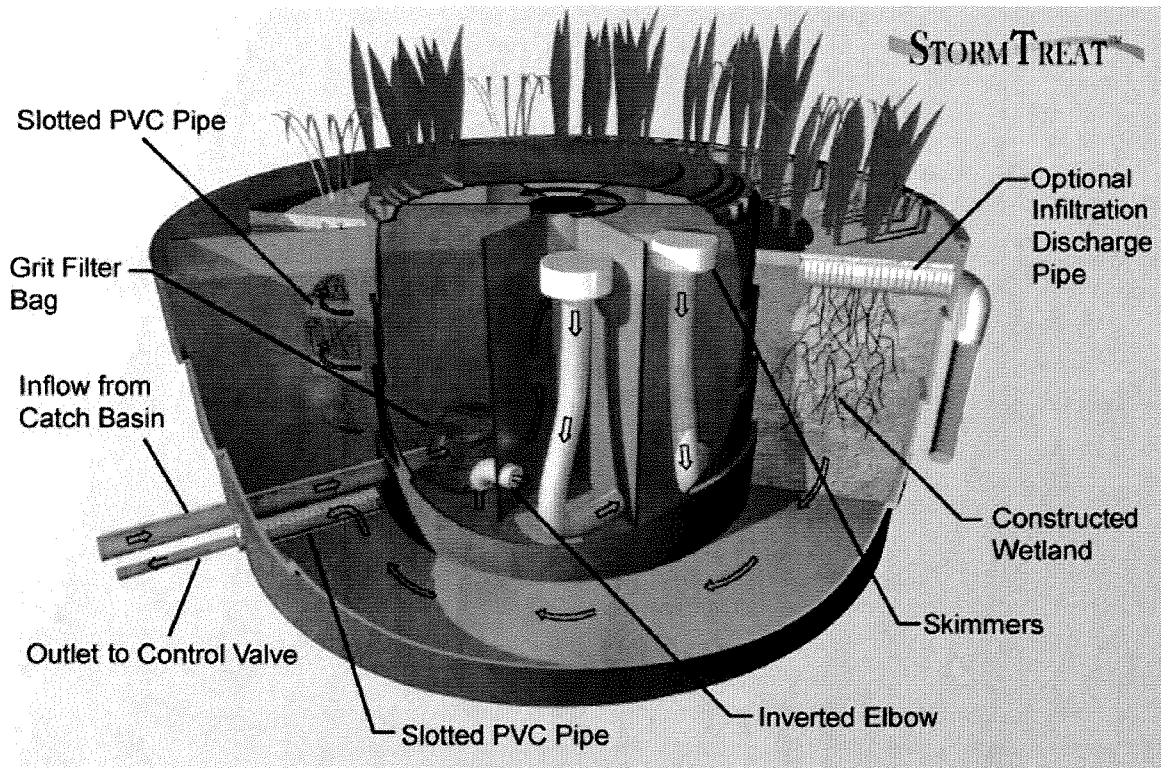


Figure 10: Storm treat systems [Source: Biocleanenvironmental]

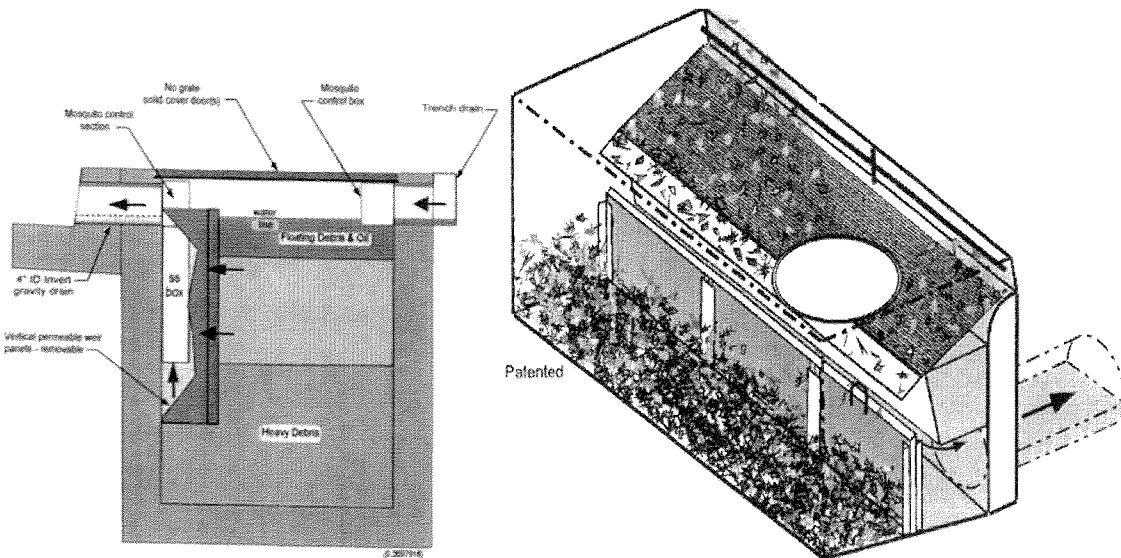


Figure 11: Catch Basin inserts [Source: Stormwatersystems]

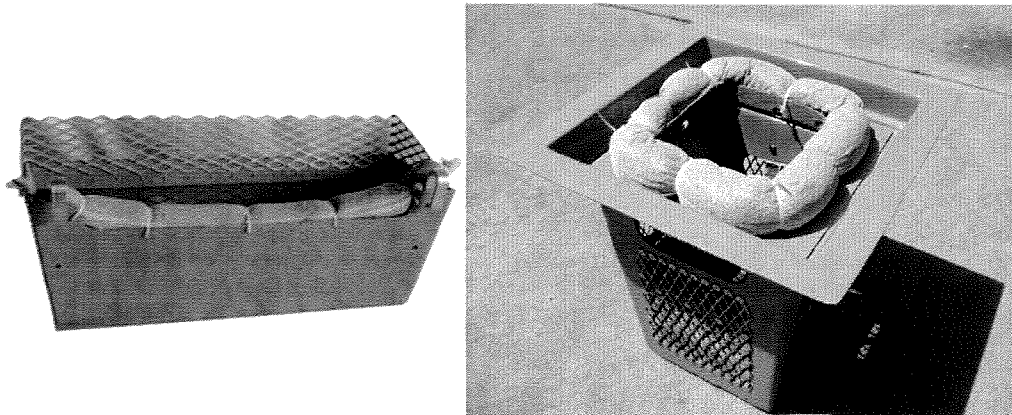


Figure 12: Catch Basin inserts [Source: Biocleanenvironmental]

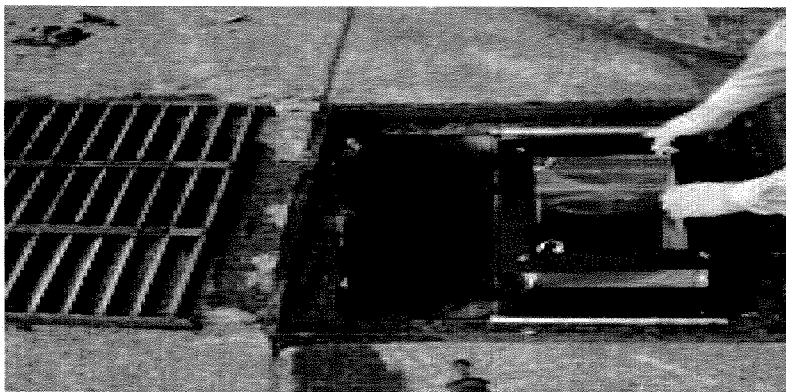


Figure 13: Enviropod [Source: Stormwater360]

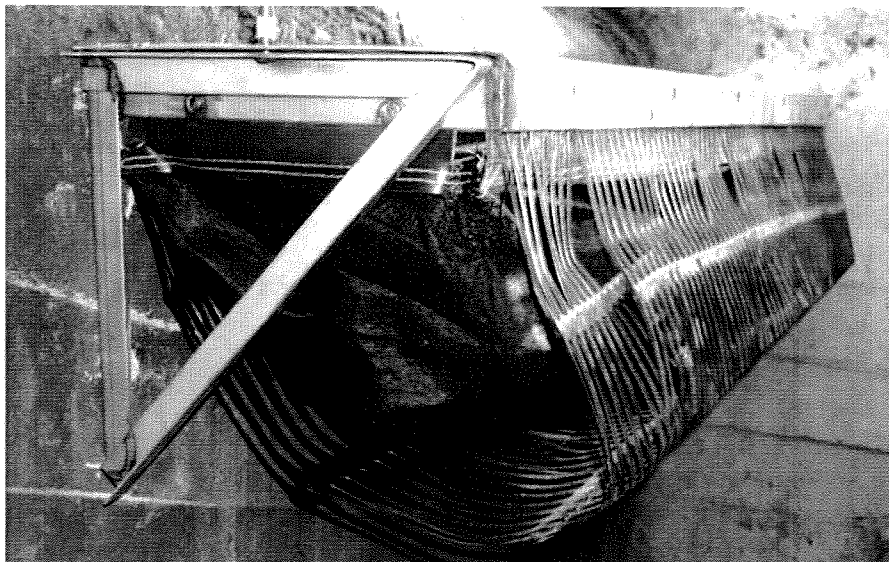


Figure 14: Drainpac [Source: Unitedstormwater]

FIELD WORK AND EXPERIMENTAL METHODOLOGY

The curb inlet devices were obtained from four different companies: Biocleanenvironmental, Storwatersystems, Stormwater360, and United Stormwater. A field evaluation of these inserts was necessary. The hydraulic performance and pollutant removal potential of these curb inlet devices were evaluated through this field study. Initially a considerable amount of time was spent in interviewing different related city agencies to gather sufficient information for a suitable analysis of this study. The Los Angeles Bureau of Sanitation, Watershed Protection division, was very helpful providing current TMDL and BMP information. Wastewater Collection System Division (WCSD) Catch Basin Cleaning Data helped in getting recent data on the amount and type of trash that is cleaned out of catch basins in the City of Los Angeles. Further, the data was interpreted quantitatively and the trash was characterized as shown in the table below.

Table 1 Characterization of trash

Category	No. of Items (%)	Density (lb/ft³)
Plastics	60	2.8
Metals	13	3.8
Paper	8	2.0
Wood	8	7.7
Polystyrene	5	0.7
Cloth/Fabric	3	8.3
Sensitive Items	1.6	NA
Miscellaneous	1	9.8
Glass	0.4	13.8

Research Testing Locations

The study was conducted with Los Angeles area being the area of major concern. Field trips were conducted to observe different BMPs in the County of Los Angeles. The region around Venice beach, City of Pasadena, and Downtown Los Angeles were toured to gather current information on the street litter, drain conditions, and BMPs.

The curb inlet devices were installed inside the University Park Campus of the University of Southern California. The Facilities Management services were instrumental in installing the curb inlets for evaluation purposes on McClintock Avenue. Five sites were available for installation. The units were installed at these sites and were observed over a time period during storm events. Some of these locations are as shown in these photographs.



Figure 14: Location 1 (McClintock avenue)



Figure 15: Location 2 ((McClintock avenue and 34th street)



Figure 16: Location 3 (McClintock avenue)



Figure 17: Location 4 (McClintock avenue)

The locations are as shown in the map below

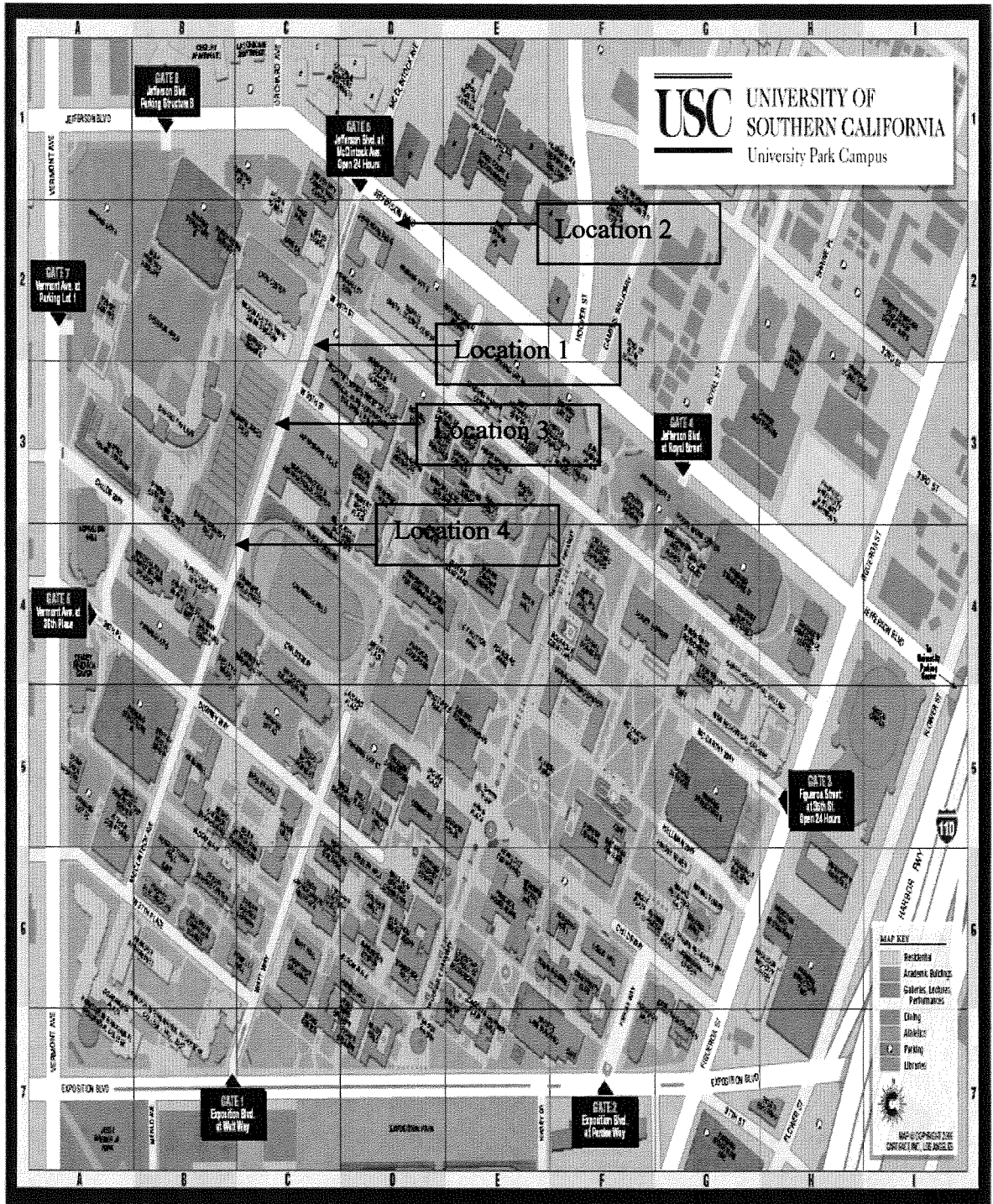


Figure 18: Map showing locations of the units on the field

Description of the units

The units have been named Insert 1, Insert 2, Insert 3, and Insert 4 respective to the location of their installation. The product name and location information are found in Appendix H.

Insert 1 is designed for grate inlet catch basins and consists of a stainless steel frame that is supported by the catch basin underneath the grate opening. The insert was modified to fit a curb inlet. Modular panels attached to the frame guide the flow of water to the screening bag. The screening bag captures trash, debris, and associated pollutants. The device allows the water to pass through to the outlet pipe. Absorbent material inside the screening bag captures oil and grease. Openings in the frame allow water to bypass the screening bag during high flow conditions. The unit is installed right underneath the manhole. The installation was easy and requires about 20 minutes to install. Insert 1 is as shown below. Cost of Insert 1 is approximately \$ 200 - \$ 300 depending on the size of the unit for including the installation cost

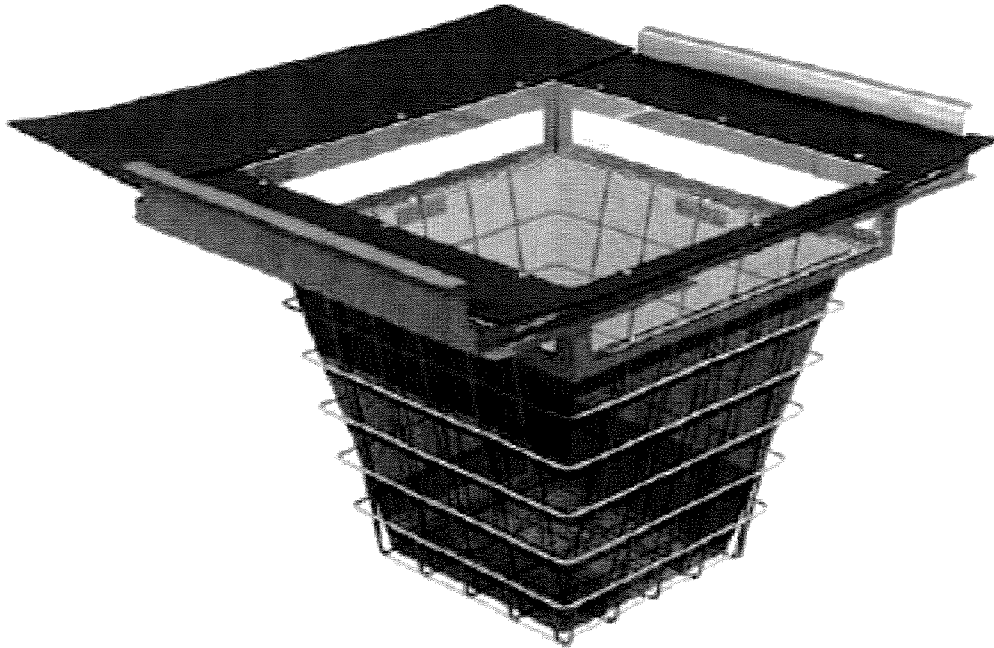


Figure 19: Insert1

Insert 2 is a unit with a removable basket suspended on a weir. The boom is attached right at the weir opening. The boom consists absorbents to trap some pollutants. This unit is mounted underneath the manhole for easy cleaning. The installation takes 15 minutes. Insert 2 is shown below in figure 20. Cost of Insert 2 is approximately \$ 675 - \$ 900 depending on the size of the unit.

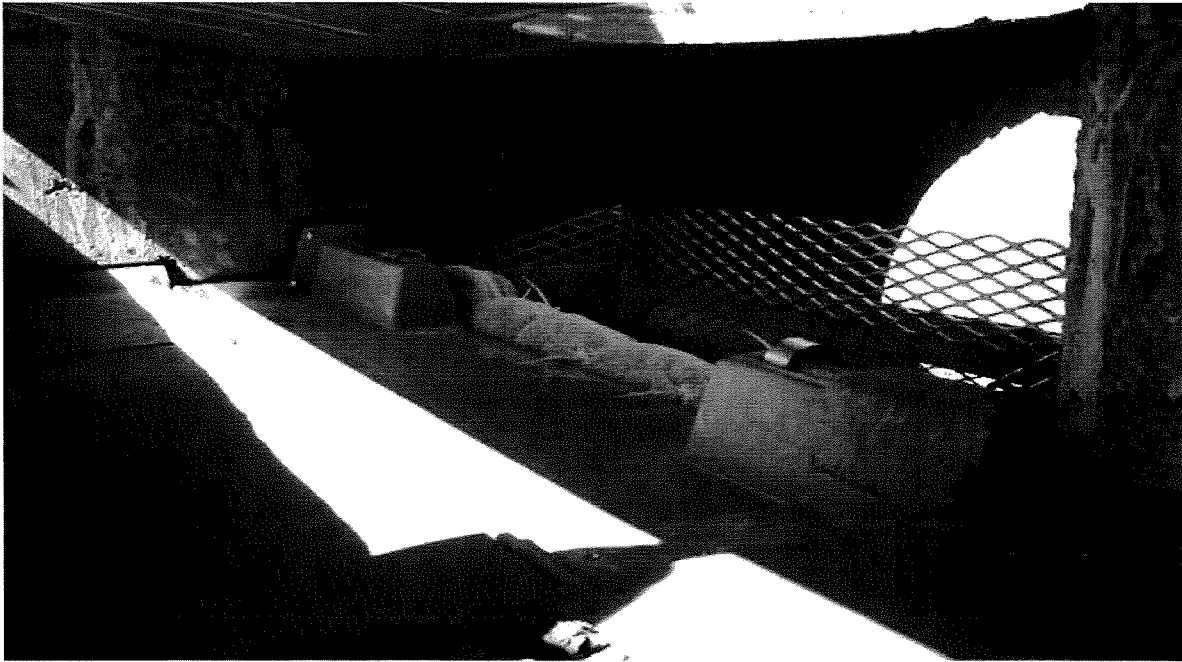


Figure 20: Insert 2

Insert 3 consists of a support basket that extends the length of the catch basin and is suspended just below the entrance of the catch basin. The support basket is placed onto the studs of the bracket. The liner is suspended in the basket and the retainer rings on the liner fit onto the studs of the bracket. The filter system is suspended above the main channel of the drain. The unit is installed in 15 minutes. The insert is as shown below in figure 21. Cost of the unit is approximately \$ 275 for a standard size vault of 4ft X 5ft. The cost is higher for larger units.

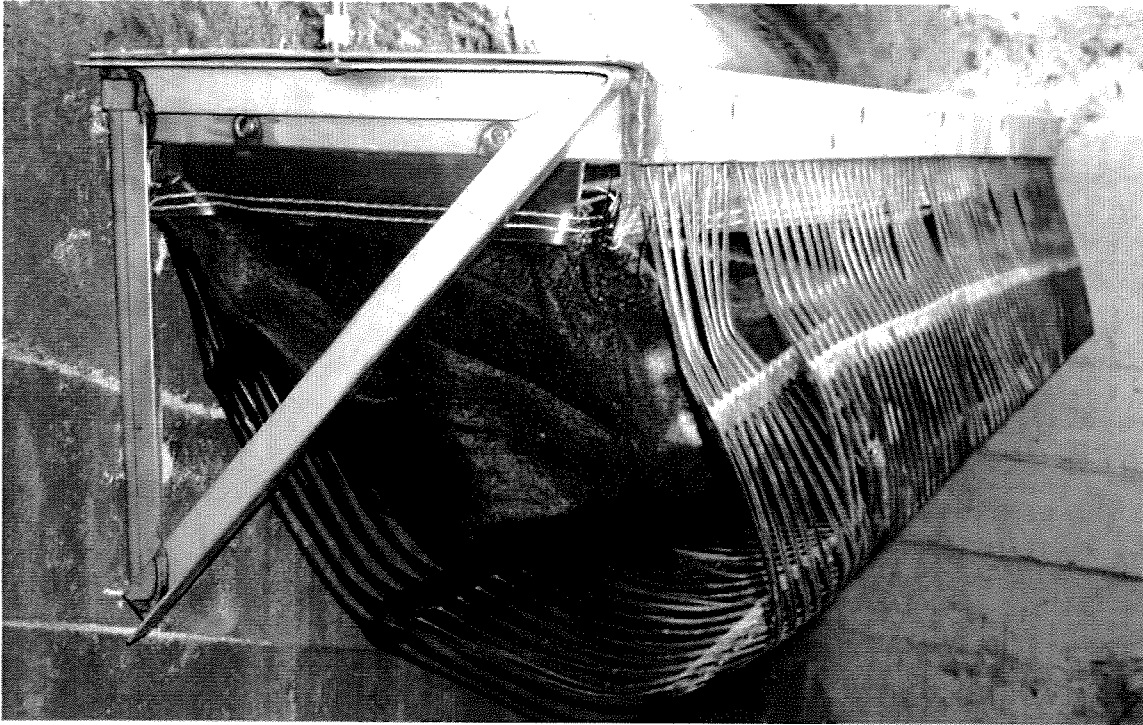


Figure 21: Insert 3

Insert 4 is a two piece design. The filtration screen uses a type of stainless steel screen that is self cleaning, high velocity capacity which passes water extremely quickly, and with low maintenance. There are narrow openings in the screen. The part of the vault right below the manhole is used as a collection basin and trash is supposed to get collected in this region. The installation takes about 45 minutes. The unit is as shown below in figure 22. Cost of the unit is approximately \$ 2100 for the 7 ft X 5ft vault. The cost of the hydroscreen in particular is approximately \$120 per ft.

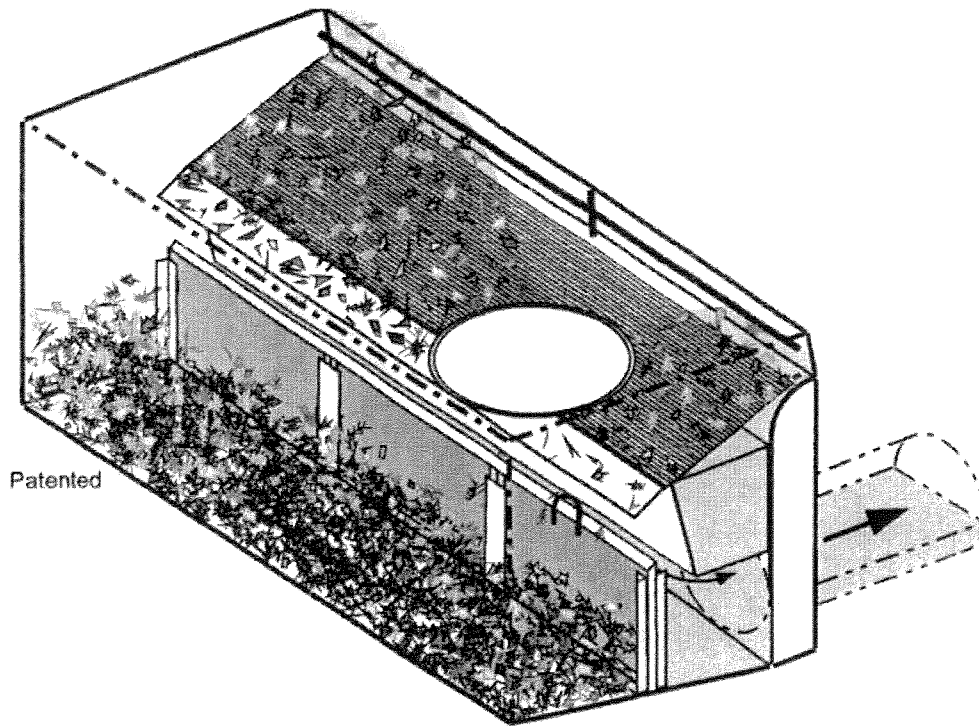


Figure 22: Insert 4

METHODOLOGY

Evaluation

The evaluation of these units considers two major topics:

1. Hydraulic performance evaluation
2. Pollutant removal potential evaluation

The evaluation for these inserts was conducted only for the worst case trash scenario. The literature review indicates that high flow conditions are very challenging to perform and only low flow conditions were tested in this project.

Considering the amount of time available for the study, only short term evaluation of these units was possible.

Hydraulic performance evaluation

The area of drainage for each basin and the hydraulic capacity of each vault was calculated in order to evaluate hydraulic performance (Appendix B – design characteristics of the catch basins). The units were filled up to 3/4ths of their capacities. Water trucks with 10,000 gallon capacity were hired. These trucks discharged water into the catch basins at an estimated 632 gallons per minute. The water was then run through these units and the observations were documented every 10 to 15 minutes. The time at which the street started flooding and the point at which the trash inside the units start to float in the water was specifically noted. The results are as shown Appendix F.

Pollutant removal potential evaluation

For this project, the pollutant removal efficiency for some pollutants entering the storm drain after passing through the curb inlet devices was evaluated. The units were again filled partially with characterized trash and some trash was laid in front of these catch basins. Subsequently small runoff was simulated using fire hydrants. A flow rate of 235 gpm was obtained in each case. The sample of the stormwater at time 0 was collected to determine the initial reading of pollutant in

the stormwater. Samples were collected at 15 minute intervals for one hour. The chemical analysis for the pollutants was performed in the lab. To get a good match on the readings, the experiment was repeated at the same flow rate for 30 minutes and this time the sample was collected every 10 minutes.

Sampling procedure

The samples were collected from underneath the curb inserts/ filters close to the entrance of the storm drain. Small buckets were placed at the entrance of storm drain with a submersible pump. The water was pumped up at 15 minute intervals in first case and 10 minute intervals in the second case. To avoid mixing of samples the water was completely drained out from the bucket just before sampling.



Figure 22: Sampling setup

Results and Discussion

Hydraulic Performance

Insert 1 does not perform well at high flow rates. The unit gets filled with water very quickly and starts flooding the streets. The trash inside the unit blocks the water from flowing into the vaults. The unit gets clogged when filled with trash and the trash starts floating in the water. The trash and insert reduce the hydraulic capacity of the vault during high flow situations.

Insert 2 does not perform well at high flow rates. The unit fills with water very quickly and starts flooding the streets. The trash inside the units prevents water from flowing into the vaults. The unit clogged when it is filled with trash. In this case, a small amount of trash also enters the storm drain. The trash starts floating in the water. The device reduces the hydraulic capacity of the vault during high flow situations.

Insert 3 does not perform well at high flow rates. The unit fills with water very quickly and starts flooding the streets. The trash inside the units prevents water from flowing into the vaults. The unit clogged when it is filled with trash. In this case, a small amount of trash also enters the storm drain. The trash starts floating in the water.

Insert 4 does not perform well at high flow rates. The unit fills with water very quickly and starts flooding the streets. The trash is in the back section of the vault. The water flows well into the storm drain and the trash gets collected for a while. At high flow rates, the water enters the collection section and suspends the trash. The trash starts floating. The unit reduces the hydraulic capacity of the vault during high flow situations. The trash does not enter the storm drain directly until the flooding occurs.

The Performance ranking is as in Appendix K. Ranking system goes from 1 being poor to 10 being excellent.

Pollutant Removal Potential

The graphs in Appendix I show the performance of each unit with respect to all the pollutants. Concentration of pollutants in the effluent is plotted against time. The concentration is a direct correlation with pollutant removal efficiency. The table below shows the pollutant removal efficiency of each pollutant with respect to the inserts. P^H and Temperature are not influenced by the inserts.

Table 2 Pollutant Removal Efficiencies

Percentage Removal (%)	Turbidity (NTU)	Total Dissolved Solids	Chemical Oxygen Demand	Biochemical Oxygen Demand	Total Organic Carbon	Total Phosphates	Total Nitrates	Total Iron	Zinc
Insert 1	81.58	11.8	32.8	24.29	21.83	2.82	80.31	27.28	22.92
Insert 2	84.22	8.8	31.79	30.81	23.73	12.59	84.94	63.64	79.17
Insert 3	81.58	8.27	26.7	20.38	21.48	23.08	83.75	76.48	79.17
Insert 4	78.95	9.67	24.73	24.93	20.85	-2.57	79.72	71.88	81.25

All the inserts are considerably efficient at turbidity removal. TDS is not influenced by any of the inserts. Chemical oxygen demand, Biochemical oxygen demand and Total oxygen carbon are correlated and there is very little change in the readings. There is a reduction in effluent concentration values, but these are still much higher than the discharge standards.

The inserts do not moderate phosphates. The booms and the absorbents in all the inserts have no influence on phosphates. However, they appear to influence the nitrate, iron, and zinc removal to a great extent. Insert 1 does not remove zinc. The trash itself acts as filter in Insert 1, Insert 2, and Insert 3 up to a certain extent. In the case of insert 4, there is a chance of rapid fouling since the water

does not drain out completely from the collection section. This adds to the pollution. The outcome cannot, however, be substantiated with short period analysis. Complete analysis would include a long-term evaluation at topographically different sites.

Economic Analysis

The capital cost of installation is definitely important. But, the maintenance cost for all these units is as important as the units purchase price. These units need to be maintained constantly to keep them functional. Insert 1 costs approximately \$ 200 per unit. Unit is not expensive but needs constant maintenance. It needs cleaning about 4 times a year. In case of insert 1 the vault does not need any kind of cleaning as no trash can enter the storm drain. Insert 2 is also not expensive but the vault needs cleaning occasionally. Insert 2 costs approximately \$ 275 per unit. Cost of insert 3 is approximately \$ 675. It needs constant maintenance. It needs cleaning 2 to 3 times a year. In this case the water drains out completely and the problem of fouling needs lesser concern. Insert 4 costs \$ 2100 for a 7ft X 5ft vault. The need for maintenance is less as it utilizes a part of the vault as the collection basin. If the problem of fouling is addressed, the need for maintenance will reduce to cleanup just once a year.

The maintenance cost is about \$ 105 for a standard 3ft X 5ft vault which is currently incurred by the City of Los Angeles. There are 34000 catch basins in Los Angeles and 90000 in Los Angeles County. The life span for these units is considered to be 10 years. It was estimated that for a catch basin insert, it costs the city approximately \$ 1000 /year including maintenance on an average.

CONCLUSIONS AND RECOMMENDATIONS

1. The Curb inlet devices are good trash collecting devices.
2. The Curb inlet devices perform well at low and normal flow rates.
3. The hydraulic performance decreases when the flow rates are high.
4. Insert 1 and Insert 2 reduce the hydraulic capacity of the catch basins.
5. The inserts do a good job reducing the turbidity.
6. Insert 2, Insert 3 and Insert 4 do well in reducing nitrates, iron, and zinc.
7. None of the inserts remove phosphorus, which is a major contaminant in rivers and lakes. Aquatic life is greatly affected by phosphates in lakes and rivers.
8. Maintenance of the units is easy and requires no special equipment.
9. Insert 1, 2, and 3 need maintenance every three months during the dry season and more frequently during the storm season.
10. Insert 4 needs monitoring and cleaning of the collection basin to prevent fouling. Dry season maintenance is required once every 6 months.

It should be noted that short-term analysis was conducted with respect to these inserts. A more rigorous study needs to be done with respect to hydraulic performance. Different street slopes and catch basin slopes need to be considered in the study. Residential, Industrial, and Commercial areas need to be incorporated in the long-term evaluation.

GLOBAL APPLICATIONS OF THIS STUDY

In the cities of the developing world, it is the urban poor who are affected the most by problems related to poor drainage and water quality. Poor communities often inhabit low value marginal land. This land is either prone to flooding or on steep hillsides and is therefore unattractive for development. Although the consequences of flooding can be devastating, the benefits of living near sources of employment and urban services generally outweigh the disadvantages for the poor. In poorly drained areas, urban runoff mixes with sewage from overflowing latrines and sewers, causing pollution and a wide range of problems associated with waterborne diseases. Flooded septic tanks and leach pits provide breeding sites for mosquitoes, and faecally contaminated wet soils provide ideal conditions for the spread of intestinal worm infections. Infiltration of polluted water into low-pressure water-distribution systems contaminates drinking water supplies causing outbreaks of diarrhea and other gastro-intestinal illnesses.

Many problems associated with the operation of stormwater drainage systems are linked to poor solid waste management. Municipal agencies responsible for solid waste management lack sufficient resources and equipment for drain cleaning. The curb inlet devices may not be the only solution but definitely help in reduction of trash entering water bodies. This leads to pollution control for local water bodies used for drinking and domestic purposes. Catch basin inserts can be brought into practice in urban regions of the developing nations. The manufacturing of these units will be cheaper with the available resources in some of the developing nations and the catch basin inserts can be used as a good system to control stormwater pollution to a great extent.

Appendix A

Effluent Discharge Standards [Source: CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD ORD

Constituents	Units	Discharge Limitations	
		Daily Maximum	Montly
Total Suspended Solids	mg/L	150	
Turbidity	NTU	150	
BOD ₅ 20°C	mg/L	30	
Oil and Grease	mg/L	15	
Settleable Solids	ml/L	0.3	
Sulfides	mg/L	1.0	
Phenols	mg/L	1.0	
Residual Chlorine	mg/L	0.1	
Acetone	µg/L	700	
Acrolein	µg/L	100	
Acrylonitrile	µg/L	0.059	
Benzene	µg/L	1.0	
Bromoform	µg/L	4.3	
Carbon tetrachloride	µg/L	0.25 ^s	
Chlorobenzene	µg/L	30	
Chlorodibromomethane	µg/L	0.401 ^s	
Chloroethane	µg/L	100	
Chloroform	µg/L	100	
Dichlorobromomethane	µg/L	0.56	
1,1-Dichloroethane	µg/L	5	
1,2-Dichloroethane	µg/L	0.38 ^s	
1,1-Dichloroethylene	µg/L	0.057 ^s	
1,2-Dichloropropane	µg/L	0.52	
1,3-Dichloropropylene	µg/L	0.5	
Di-isopropyl ether (DIPE)	µg/L	0.8	
1,4-Dioxane	µg/L	3	
Ethylbenzene	µg/L	700	
Ethylene dibromide	µg/L	0.05 ^s	
Lead	µg/L	5.2	
Methyl bromide	µg/L	10	
Methyl chloride	µg/L	3	
Methylene chloride	µg/L	4.7	
Methyl ethyl ketone (MEK)	µg/L	700	
Methyl tertiary butyl ether (MTBE)	µg/L	5	

Appendix A (Continued)

Effluent Discharge Standards [Source: CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD]

Constituents	Units	Discharge Limits	
		Daily Maximum	Monthly Maximum
Naphthalene	µg/L	21	
N-Nitrosodimethyl amine (NDMA)	µg/L	0.00069 ⁵	
Perchlorate	µg/L	4	
Tertiary butyl alcohol (TBA)	µg/L	12	
1,1,2,2-Tetrachloroethane	µg/L	0.17 ³	
Tetrachloroethylene	µg/L	0.8	
Toluene	µg/L	150	
Total petroleum hydrocarbons*	µg/L	100	
1,2-Trans-dichloroethylene	µg/L	10	
1,1,1-Trichloroethane	µg/L	200	
1,1,2-Trichloroethane	µg/L	0.60	
Trichloroethylene	µg/L	2.7	
Vinyl chloride	µg/L	0.5	
Xylenes	µg/L	1750	

Appendix B
Design Characteristics of the Stormwater Vaults

Hydraulic Performance	Length (ft)	Width (ft)	Height (ft)	Curb opening (ft)	Number of Pipes entering the Vault	Number of Pipes leaving the Vault	Size of the storm drain pipe entering the Vault	Size of the storm drain pipe leaving the Vault (inches)
Vault 1	3.7	3.9	4.6	0.5	0	1	0	12
Vault 2	3.5	3.6	4.8	0.58	0	1	0	12
Vault 3	3.5	3.6	4.8	0.58	0	1	0	12
Vault 4	6.8	4.3	5	0.6	0	1	0	12

Appendix C

Results of the Field Test (Discharge: 235 gpm)

Sample at Time 0	Temperature (C)	PH	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Dissolved oxygen (mg/L)	~ Chemical Oxygen Demand (mg/L)	~ Biochemical Oxygen Demand (mg/L)	~ Total Organic Carbon (mg/L)	~ Total Phosphates (mg/L)
Insert 1	22	3.5	38	1500	1.8	1250	1050	1017	85.4
Insert 2	22	3.5	42	1500	1.8	1290	1055	978	85.8
Insert 3	22	3.5	46	1500	1.8	1255	1055	815	85.8
Insert 4	22	3.5	40	1500	1.8	1262	1055	1137	85.8
Sample at Time 15	Temperature (C)	PH	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Dissolved oxygen (mg/L)	~ Chemical Oxygen Demand (mg/L)	~ Biochemical Oxygen Demand (mg/L)	~ Total Organic Carbon (mg/L)	~ Total Phosphates (mg/L)
Insert 1	22	4.2	21	1467	1.8	1150	981	935	80
Insert 2	22	4.1	25	1456	1.8	1145	942	868	77
Insert 3	22	4	25	1435	1.8	1132	970	736	79
Insert 4	22	4.2	26	1460	1.8	1200	990	1082	81
Sample at Time 30	Temperature (C)	PH	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Dissolved oxygen (mg/L)	~ Chemical Oxygen Demand (mg/L)	~ Biochemical Oxygen Demand (mg/L)	~ Total Organic Carbon (mg/L)	~ Total Phosphates (mg/L)
Insert 1	22	5.2	12	1350	2.1	1021	901	831	74
Insert 2	22	5.1	12	1400	2	1020	910	773	74
Insert 3	22	5.1	12	1469	2	1018	912	662	75
Insert 4	22	5.1	12	1402	2.4	1200	940	1082	77

Appendix C (Continued)
Results of Field test (Discharge: 235 gpm)

Sample at Time 45	Temperature (C)	PH	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Dissolved oxygen (mg/L)	~ Chemical Oxygen Demand (mg/L)	~ Biochemical Oxygen Demand (mg/L)	~ Total Organic Carbon (mg/L)	~ Total Phosphates (mg/L)
Insert 1	22	5.8	8	1376	2.1	882	841	820	69
Insert 2	22	5.8	8	1345	2	890	830	776	68
Insert 3	22	5.8	9	1440	2	924	856	648	86
Insert 4	22	5.8	8	1289	2.4	976	900	921	92
Sample at Time 60	Temperature (C)	PH	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Dissolved oxygen (mg/L)	~ Chemical Oxygen Demand (mg/L)	~ Biochemical Oxygen Demand (mg/L)	~ Total Organic Carbon (mg/L)	~ Total Phosphates (mg/L)
Insert 1	22	5.8	7	1323	2.1	840	795	795	83
Insert 2	22	5.8	6	1368	2	880	730	746	75
Insert 3	22	5.8	7	1376	2	920	840	640	66
Insert 4	22	5.8	8	1355	2.4	950	792	900	88

Appendix D
Results of the Field Test (Repetitions for a shorter time)
Discharge: 235 gpm

Sample at Time 0	Temperature (C)	PH	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Dissolved oxygen (mg/L)	~ Chemical Oxygen Demand (mg/L)	~ Biochemical Oxygen Demand (mg/L)	~ Total Organic Carbon (mg/L)	~ Total Phosphates (mg/L)
Insert 1	24	3.9	45	1560	1.2	1250	1050	1017	86
Insert 2	24	3.9	46	1572	1.5	1266	991	960	81
Insert 3	24	3.9	45	1500	1.5	1240	1010	806	83
Insert 4	24	3.9	45	1566	1.5	1255	1010	1131	83
Sample at Time 10	Temperature (C)	PH	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Dissolved oxygen (mg/L)	~ Chemical Oxygen Demand (mg/L)	~ Biochemical Oxygen Demand (mg/L)	~ Total Organic Carbon (mg/L)	~ Total Phosphates (mg/L)
Insert 1	24	4.6	33	1500	1.6	1181	940	961	77
Insert 2	24	4.8	32	1523	1.7	1130	900	857	74
Insert 3	24	4.8	32	1489	1.7	1146	942	745	77
Insert 4	24	5	30	1445	1.6	1200	991	1082	132
Sample at Time 20	Temperature (C)	PH	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Dissolved oxygen (mg/L)	~ Chemical Oxygen Demand (mg/L)	~ Biochemical Oxygen Demand (mg/L)	~ Total Organic Carbon (mg/L)	~ Total Phosphates (mg/L)
Insert 1	24	4.6	24	1460	2	1040	887	846	120
Insert 2	24	4.8	23	1444	2	1075	845	815	121
Insert 3	24	4.8	24	1439	2	1075	870	699	118
Insert 4	24	5	25	1389	2	1162	900	1047	124

Appendix D (Continued)
Results of the Field Test (Repetitions for a shorter time)
Discharge: 235 gpm

Sample at Time 30	Temperature (C)	PH	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Dissolved oxygen (mg/L)	~ Chemical Oxygen Demand (mg/L)	~ Biochemical Oxygen Demand (mg/L)	~ Total Organic Carbon (mg/L)	~ Total Phosphates (mg/L)
Insert 1	24	4.6	15	1400	2	1000	750	814	112
Insert 2	24	4.8	15	1345	2	1051	750	797	110
Insert 3	24	4.8	15	1378	2	1040	800	676	110
Insert 4	24	5	15	1256	2	1100	730	991	120

Appendix E
Trash Characteristics

Characterization of Trash	Temperature (C)	PH	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Dissolved oxygen (mg/L)	~ Chemical Oxygen Demand (mg/L)	~ Biochemical Oxygen Demand (mg/L)	~ Total Organic Carbon (mg/L)	~ Phos (n
Trash 1	20	2.5	-	-	-	4000	2500	-	
Trash 2	20	2.2	-	-	-	4250	2290	-	

Source of Trash 1: Los Angeles Sanitation Services

Source of Trash 2: United Stormwater

Appendix F
Hydraulic Performance (Discharge: 632 gpm)

Hydraulic Performance	Size of the storm drain pipe leaving the Vault (inches)	Total Area of the Vault (Sq.ft)	Hydraulic Capacity of the Vault (cubic ft)	Hydraulic Capacity of the Vault (gallons)	15 minutes	25 minutes	35 minutes
Vault 1	12	14.43	59	374	Water exceeds the vault capacity	Street Starts flooding	Street Starts flooding
Vault 2	12	12.6	54	403.98	Water exceeds the vault capacity	Street Starts flooding	Street Starts flooding
Vault 3	12	12.6	54	403.98	Water flows into the storm drain by overflowing	Trash starts flowing into the storm drain	Street Starts flooding

Appendix F (Continued)
Hydraulic Performance (Discharge: 632 gpm)

Vault 4	12	29.24	129	964.92	Water filled up to the brim of the vault	Street Starts flooding	St flo
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Appendix G
Pollutant Removal Efficiency of the Curb Inlet Inserts

Percentage Removal (%)	Turbidity (NTU)	Total Dissolved Solids	Chemical Oxygen Demand	Biochemical Oxygen Demand	Total Organic Carbon	Total Phosphates	Total Nitrates
Insert 1	81.58	11.8	32.8	24.29	21.83	2.82	80.31
Insert 2	84.22	8.8	31.79	30.81	23.73	12.59	84.94
Insert 3	81.58	8.27	26.7	20.38	21.48	23.08	83.75
Insert 4	78.95	9.67	24.73	24.93	20.85	-2.57	79.72
Percentage Removal (%)	Turbidity (NTU)	Total Dissolved Solids	Chemical Oxygen Demand	Biochemical Oxygen Demand	Total Organic Carbon	Total Phosphates	Total Nitrates
Insert 1	66.67	10.26	20	28.58	19.97	-30.24	66.67
Insert 2	67.4	14.45	16.99	24.32	16.98	-35.81	67.5
Insert 3	66.67	8.14	16.13	20.8	16.13	-32.54	66.67
Insert 4	66.67	19.8	12.36	27.73	12.38	-44.58	66.67

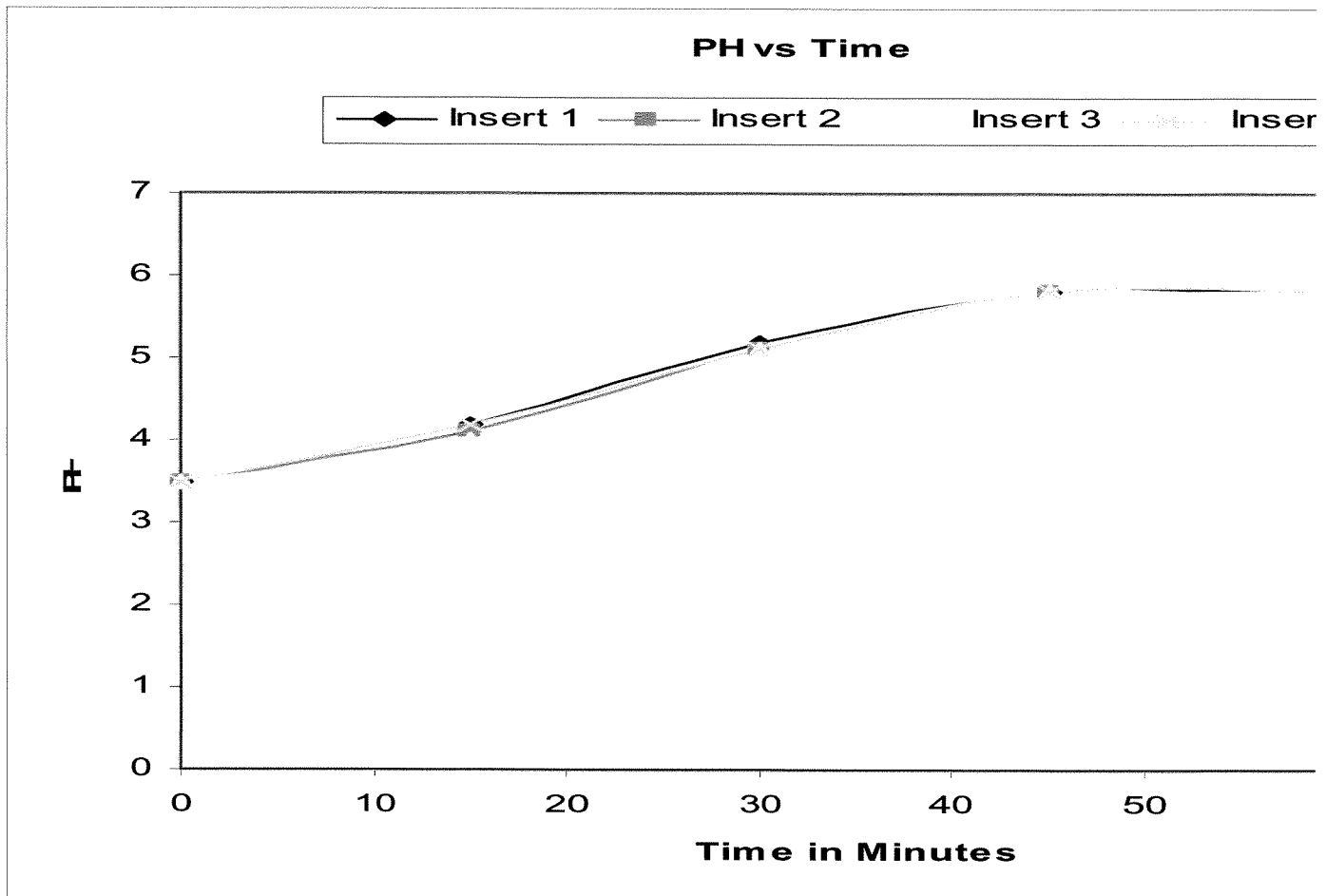
Appendix H
Insert Details

Inserts	Name of the Unit	Manufacturer/Company
Insert 1	Enviropod	Stormwater360
Insert 2	Curb Inlet Filter	Biocleanenvironmental
Insert 3	Drainpac	United Stormwater
Insert 4	Curbstop Filter	Stormwatersystems

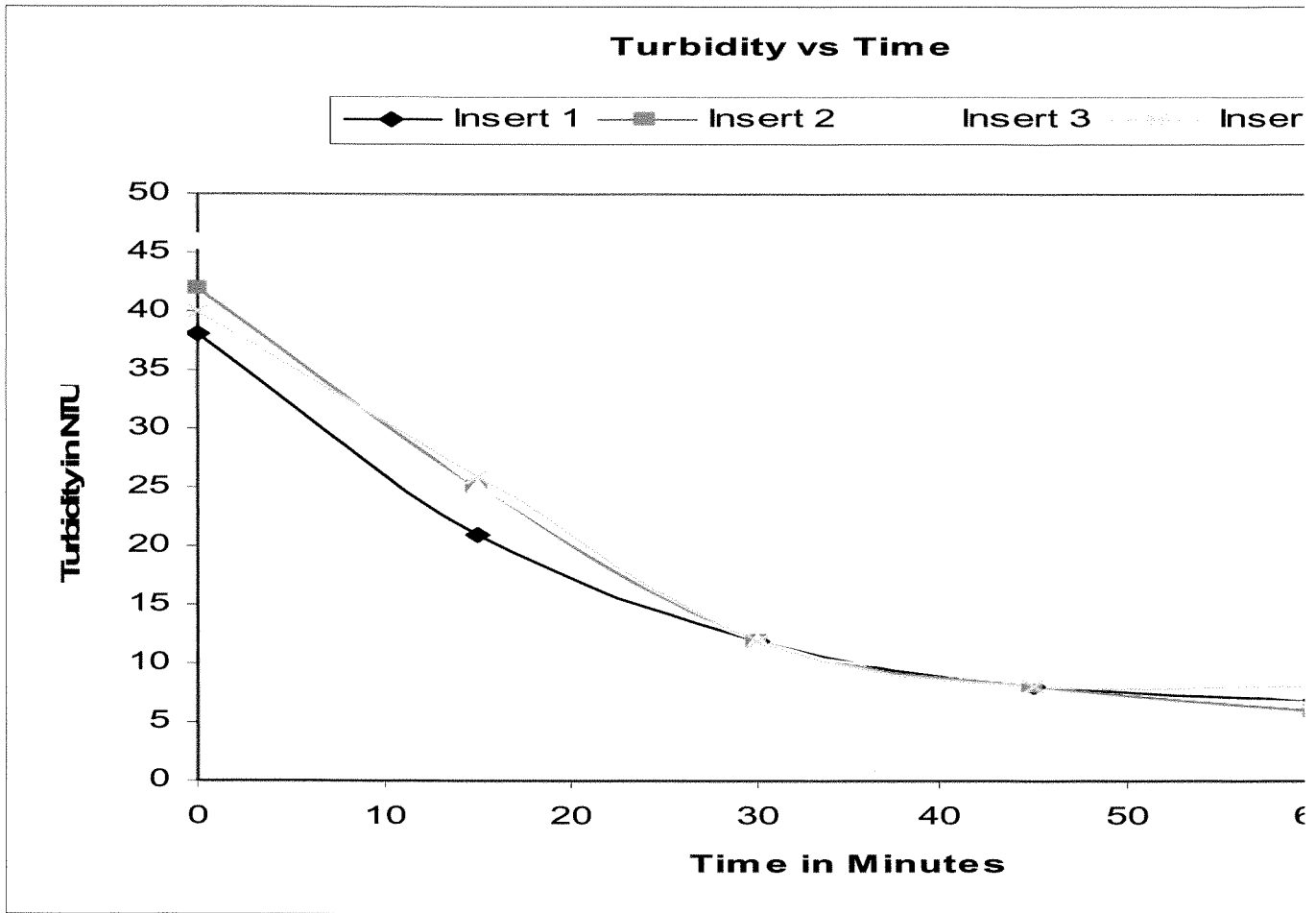
Appendix I

Graphs

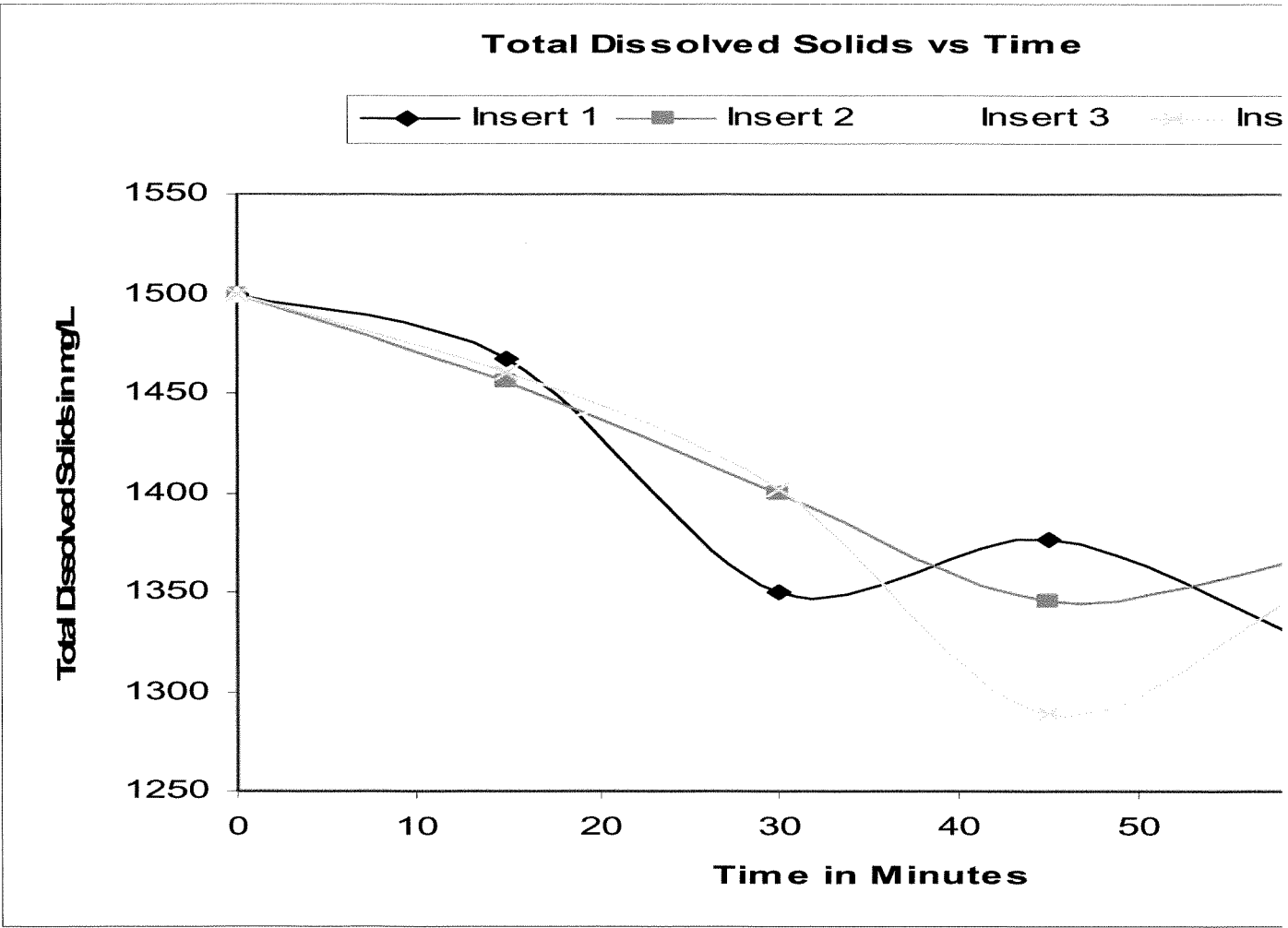
Graph 1



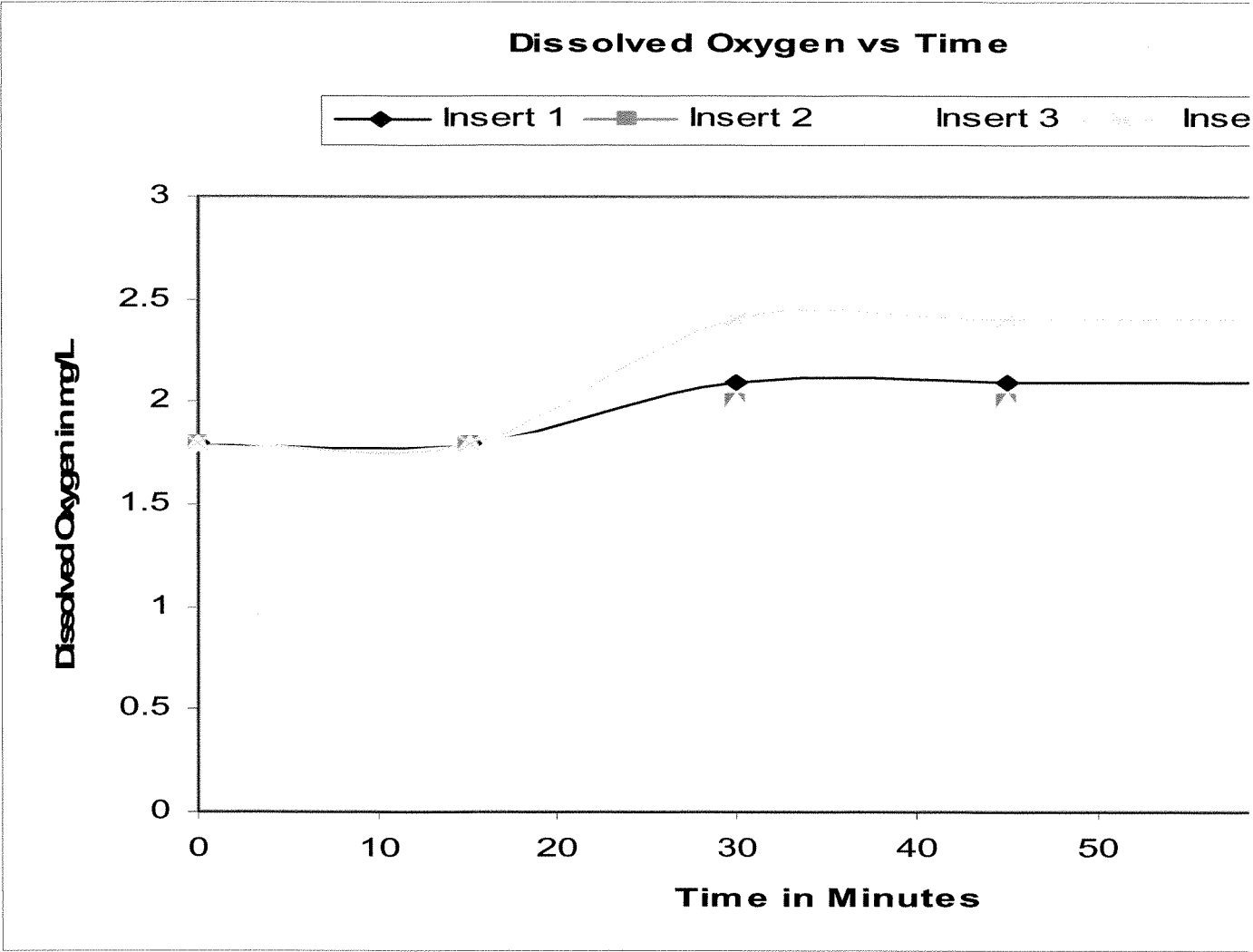
Graph 2



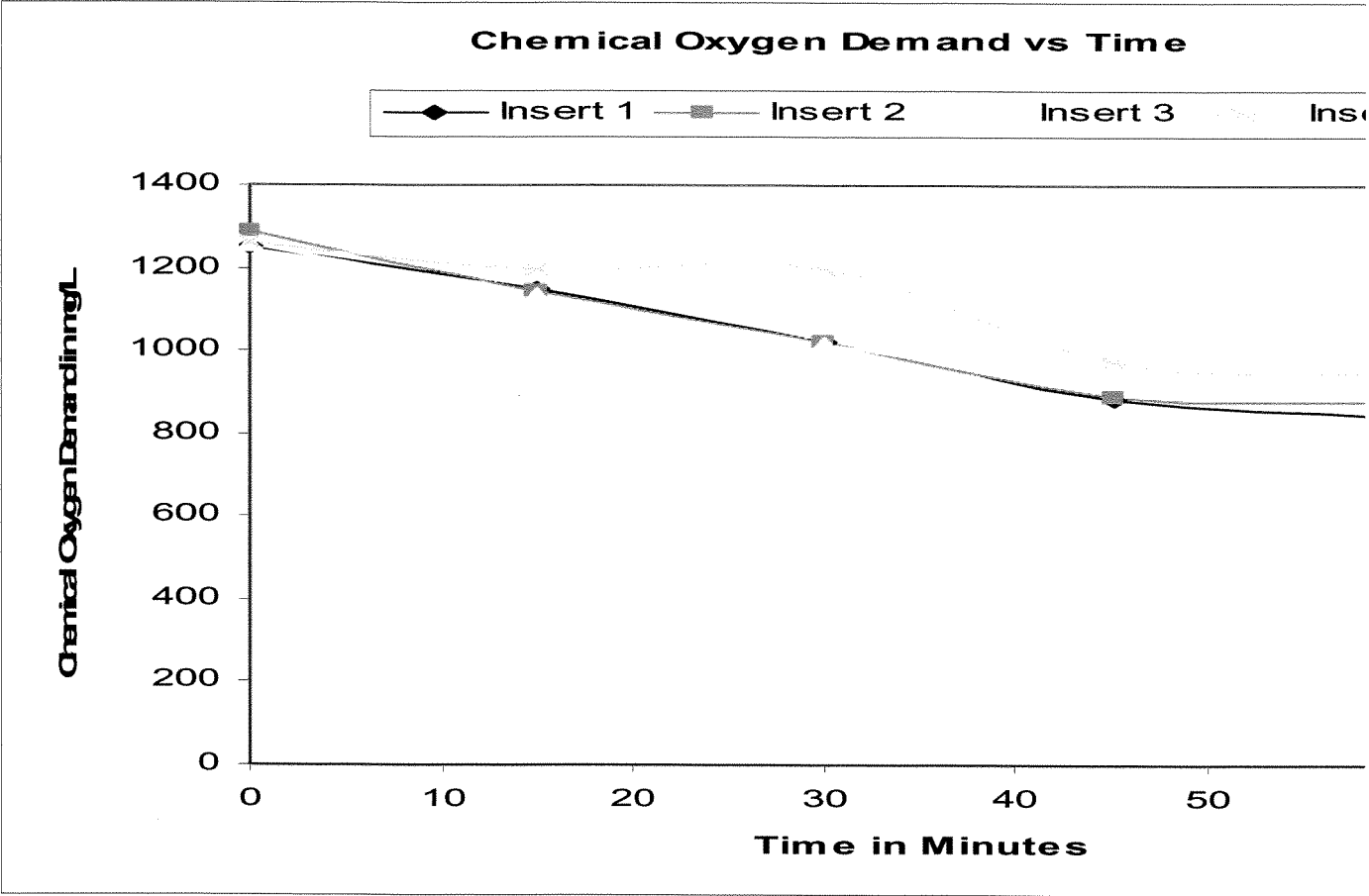
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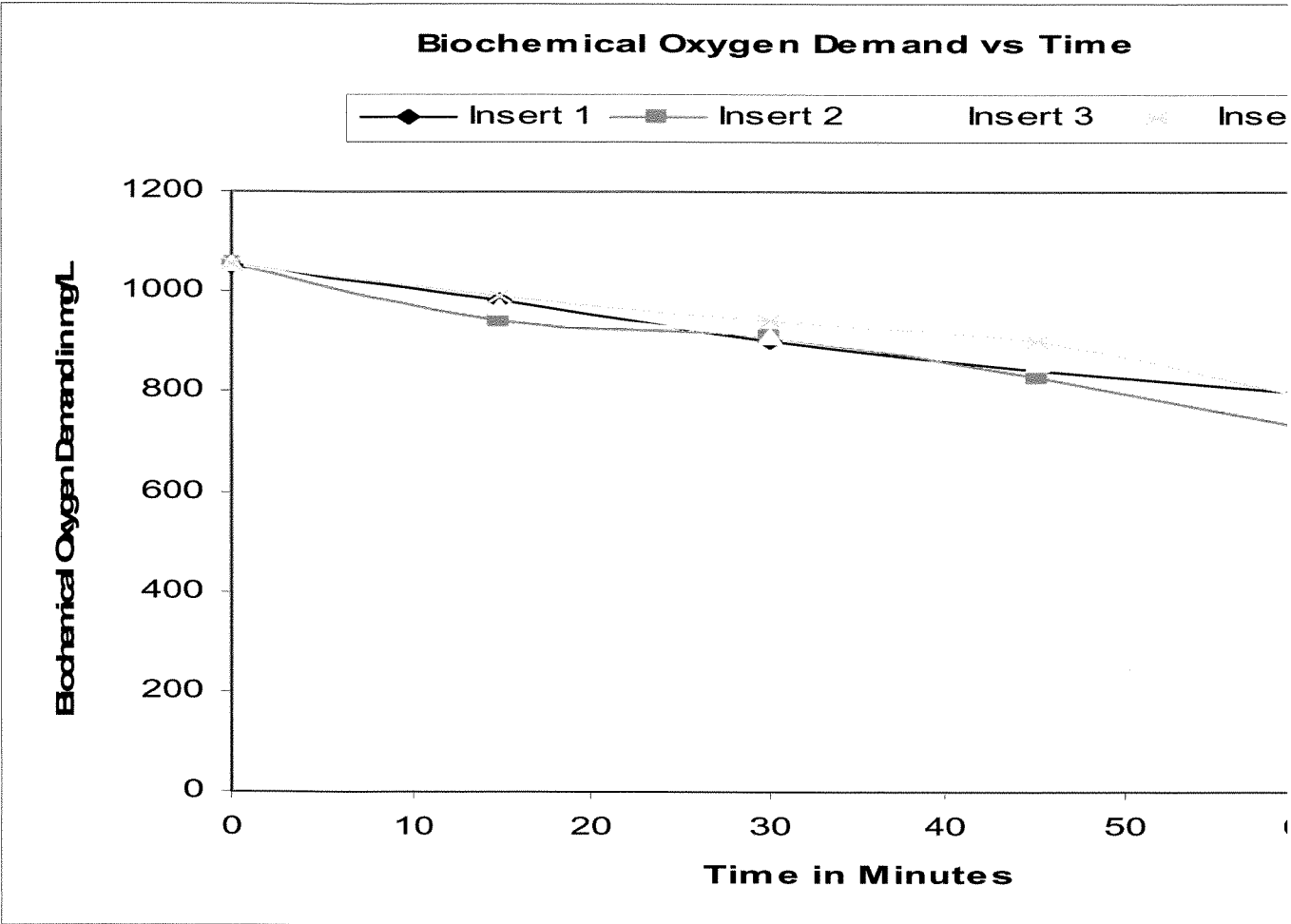
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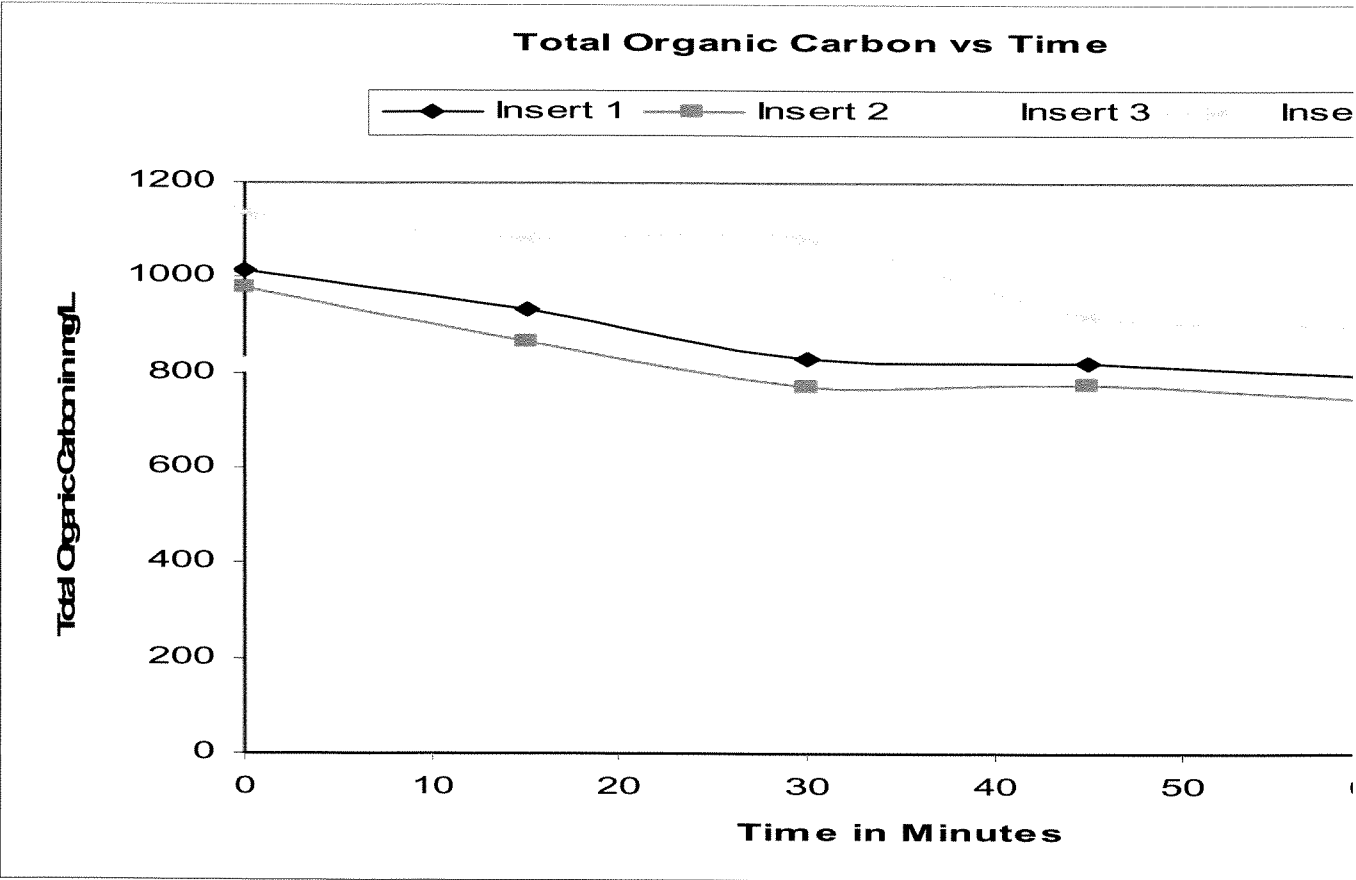
Graph 5



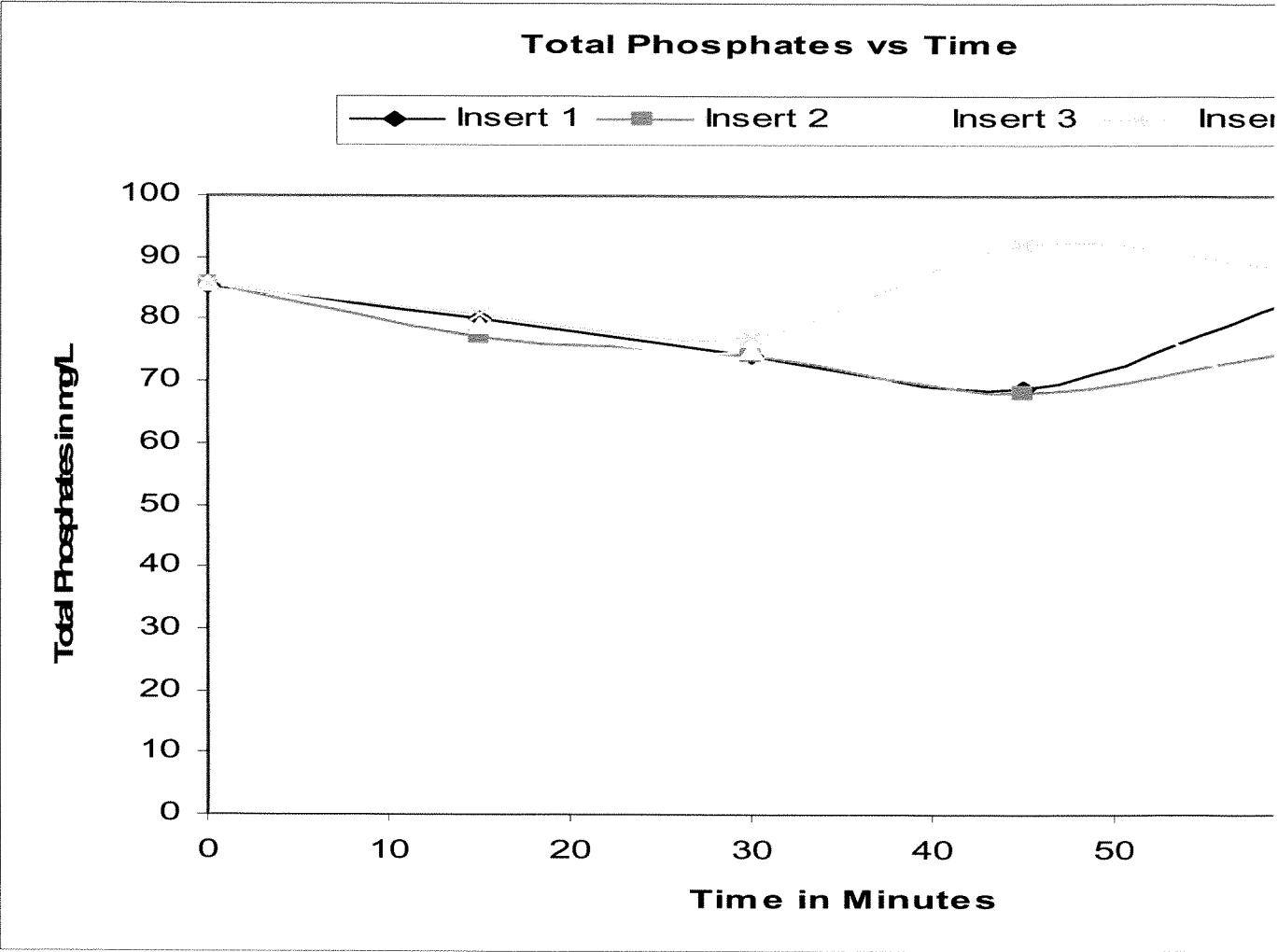
Graph 6



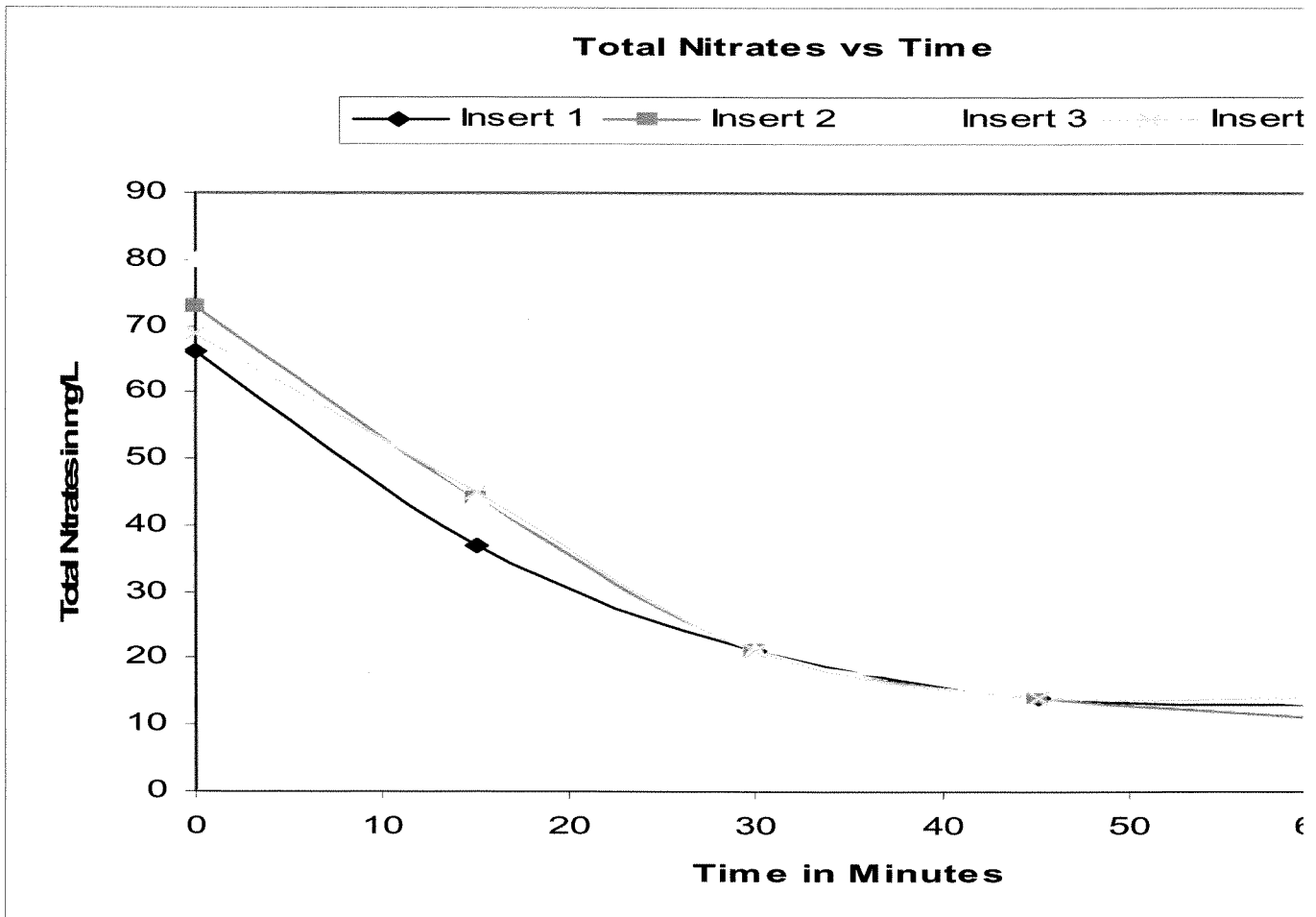
Graph 7



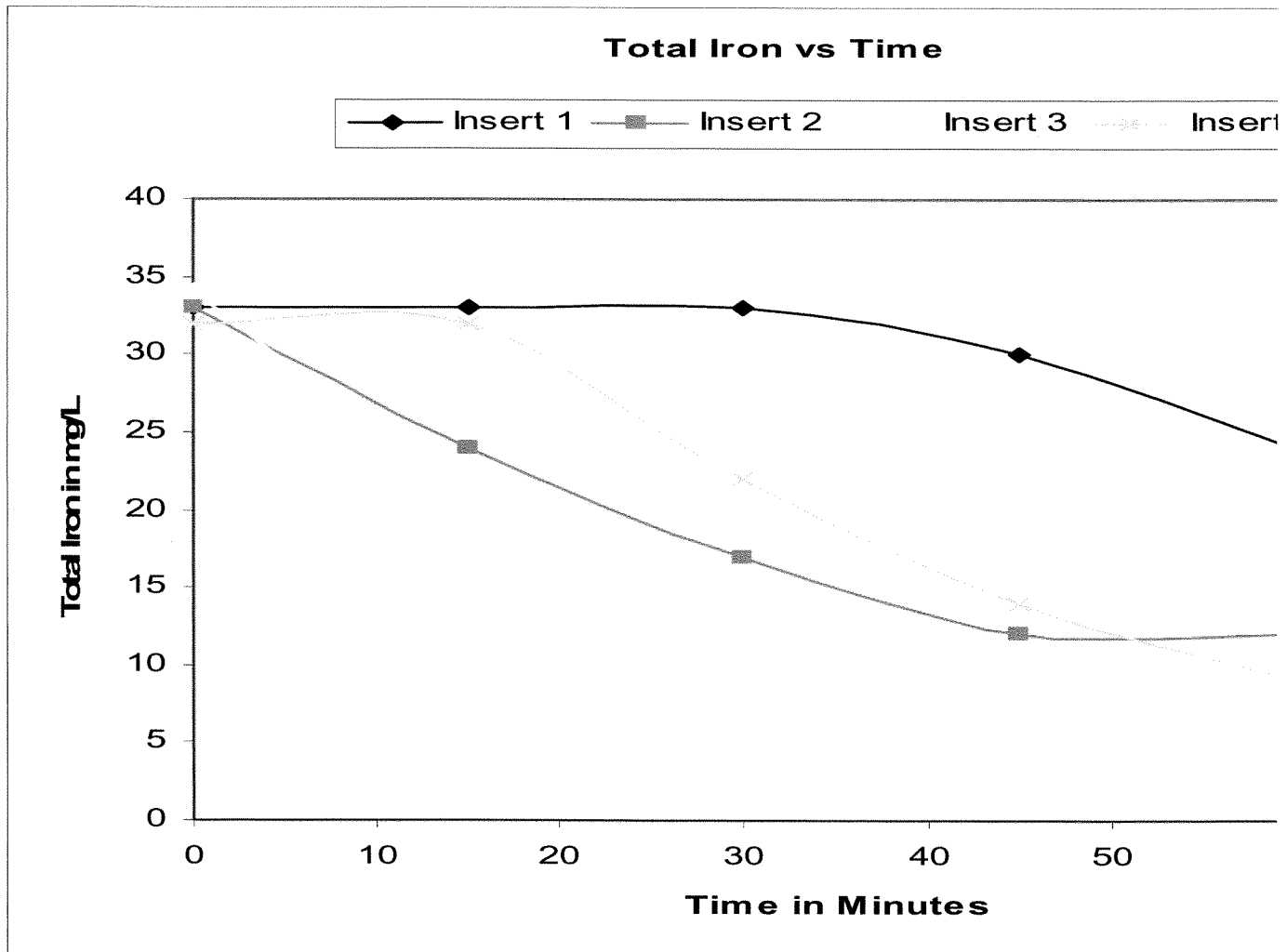
Graph 8



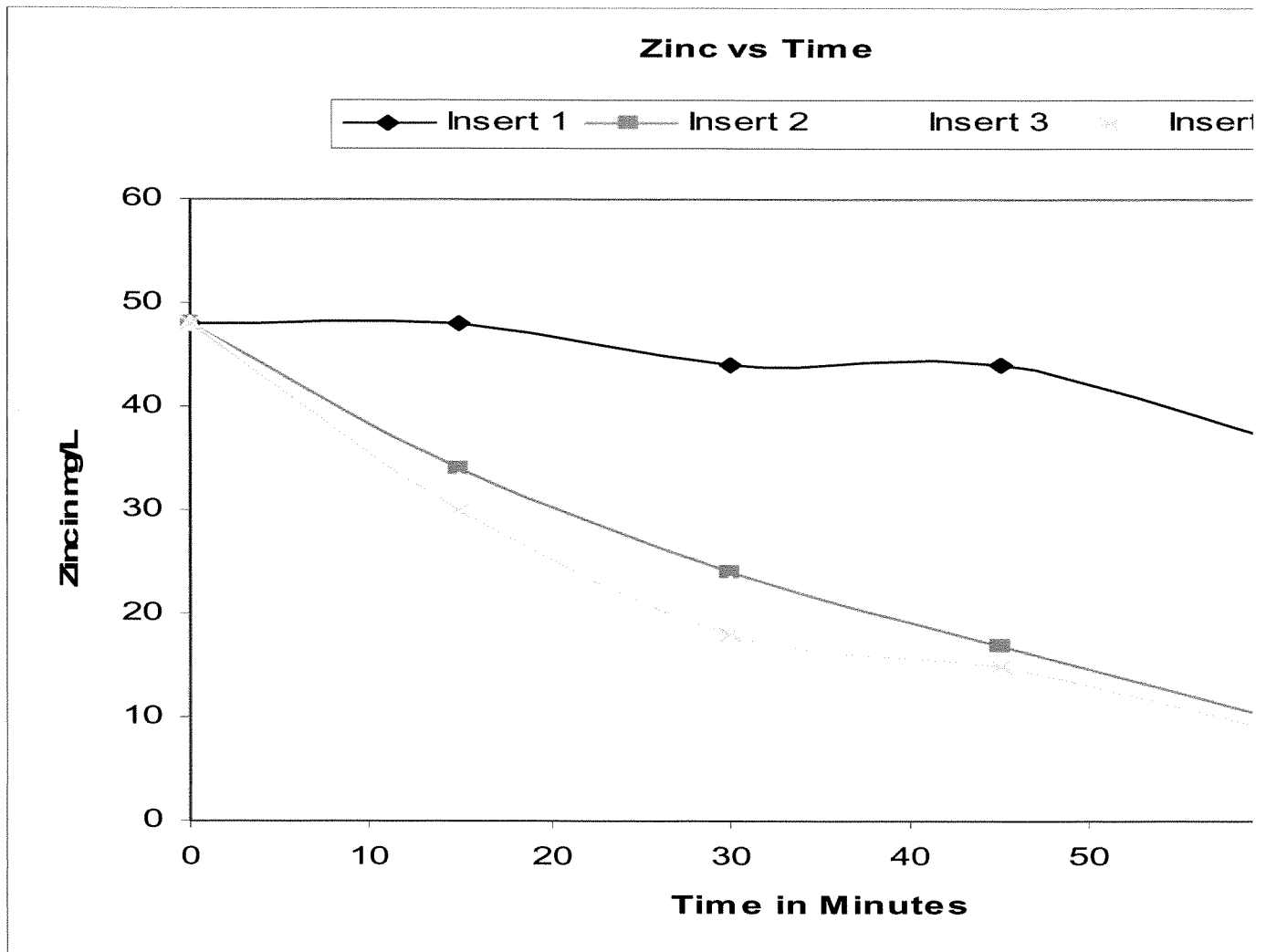
Graph 9



Graph 10



Graph 11



Appendix J

Parameter Values Comparison Chart (Standards incorporated from different sources of literature a

Parameters	Water body Discharge Standards	Insert 1	Insert 2	Insert 3
Temperature	< 40 C	22	22	22
PH	5.5 - 9.0	5.8	5.8	5.8
Turbidity (NTU)	-	7	6	7
Total Dissolved Solids (mg/L)	500	1323	1368	1376
Dissolved oxygen (mg/L)	2	2.1	2	2
Chemical Oxygen Demand (mg/L)	250	72	67	66
Biochemical Oxygen Demand (mg/L)	30	103	100	102
Total Organic Carbon (mg/L)	-	92	90	78
Total Phosphates (mg/L)	20	84	76	67
Total Nitrates (mg/L)	3.0 - 5.0	13	11	13
Total Iron (mg/ L)	5	24	12	8
Zinc (mg/L)	5	37	10	10

Appendix K
Performance Rank for Inserts
(1 - poor 10 - Excellent)

Performance Rank	Hydraulic Performance during High Flow	Hydraulic Performance during Low/Normal Flow	P H	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Dissolved oxygen (mg/L)	Chemical Oxygen Demand (mg/L)	Biochemical Oxygen Demand (mg/L)	Total Organic Carbon (mg/L)	Total Phosphorus (mg/L)
Insert 1	3	6.5	*	8	*	7	6	5	-	4
Insert 2	3	5.5	*	8	*	7	6	5	-	4
Insert 3	2	7	*	8	*	7	6	5	-	4
Insert 4	3.5	8	*	8	*	7	5	5	-	4

* Device has no influence on the parameter directly, - Insufficient information
Ranking is based on performance, TMDL requirements and sensitivity of the parameter

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ESTIMATE SHEET

COMPANY NAME: KS Engineering

ADDRESS _____

PHONE # 609-296-5564 FAX # _____

CONTACT NAME Hector

JOB NAME Konahue

JOB LOCATION San Diego

JOB NOTES:

MODEL NAME	SIZE/LENGTH	INLET TYPE	COST	QUANTITY	TAX	TOTAL
Curb Inlet Basket	15 feet	Curb	1045	2	15.68	\$2,105.68
INSTALLATION INFORMATION						
Curb Inlet Basket	15 feet	Curb	150	2		\$300.00
TOTAL PRODUCTS COST						\$2,405.68
MAINTENANCE INFORMATION			COST/FILTE	QUANTITY	TOTAL	TOTAL x 4 Times Per Year
Curb Inlet Basket			89	2	178	\$712.00
Fuel Surcharge						\$71.20
TOTAL MAINTENANCE COST PER YEAR						\$783.20

10/2/2007

ESTIMATOR Janet Kent

BIO CLEAN

ENVIRONMENTAL SERVICES, INC.



DATE: 2-Oct-07
CUSTOMER: KS Engineering

PROJECT: Donahue
ADDRESS:

CONTACT: _____

Following please find details of Bio Clean's maintenance program and a proposal to service the Stormwater Filters located at the above referenced project.

Service and Maintenance Includes:

- Disposal of debris captured by filtration device.
- Evaluation of Hydrocarbon booms. Booms will be changed out at a minimum of at least twice per year.
- Hydrocarbon booms to be disposed of in accordance with local and state requirements.
- Transportation of debris, sediments and organics to approved facility and in accordance with local and state requirements.
- Report on collected debris, type of debris and condition of filters will be provided to landowner, city or municipality.

The Bio Clean Environmental Services Maintenance Program incorporates a tracking program used to identify each inlet unit and to preserve its history.

Contract will be billed after each service. Terms are Net 15 days. Price quoted is for yearly contract, or longer, as specified in the Service Agreement and includes four cleanings per year. Additional fuel charge of 5% will be billed each quarter.

CIB 30" to 84"	
# of Filters	0
Price per Filter	\$69.00

CIB 84" to 144"	
# of Filters	0
Price per Filter	\$79.00

CIB 144" to 180"	
# of Filters	2
Price per Filter	\$89.00

GISB Up to 28" x 36"	
# of Filters	0
Price per Filter	\$79.00

GISB 29" x 37" up to 48" x 54"	
# of Filters	0
Price per Filter	\$89.00

Up to 3' Dia or 7 Square Feet	
# of Vaults	0
Price per Vault	\$595.00

Up to 6' Dia or 28 Square Feet	
# of Vaults	0
Price per Vault	\$900.00

Up to 10' Dia or 78.5 Square Feet	
# of Vaults	0
Price per Vault	\$1,560.00

Total \$ Per Cleaning	
Filters	\$178.00
Vaults	\$0.00

X

Cleanings Per Year	
Filters	4
Vaults	0

=

TOTAL PRICE PER YEAR	
Cleanings	\$712.00
Fuel Surcharge	\$71.20

Fuel Surcharge	10%
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TOTAL	\$783.20
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Please see Bio Clean Service Agreement for specific details.

Thank you for the opportunity to provide this proposal. If you have any questions, please feel free to contact me at (760) 433-7640.

Regards,

Greg B. Kent
President

P O Box 869, Oceanside CA 92049
(760) 433-7640 Fax (760) 433-3176
www.biocleanenvironmental.net

SPECIFICATIONS

Curb Inlet Basket

I. Specifications

Coverage: The curb inlet basket provides full coverage of inlets such that all catch basin influent, at rated flows, is conveyed to the filter. The filter will retain all windblown and swept debris entering the drain.

Shelf System: The filter basket is located in the catch basin directly beneath a manhole opening for direct service/access from the manhole. The filter provides a shelf system made of UV protected marine grade fiberglass to direct water flow from the curb inlet to the filter, which is located directly under the manhole.

Non-Corrosive Materials: All components of the filter system, including mounting hardware, fasteners, support brackets, filtration material, and support frame are constructed of non-corrosive materials (316 stainless steel, and UV/marine grade fiberglass). Fasteners are stainless steel. Primary filter mesh is 316 stainless steel welded screens. Filtration basket screens for coarse, medium and fine filtration is $\frac{3}{4}$ " x 1 $\frac{3}{4}$ " expanded, 10 x 10 mesh, and 35 x 35 mesh, respectively. No polypropylene, monofilament netting or fabrics shall be used in the products.

Durability: Filter (excluding oil absorbent media) and support structures are of proven durability, with an expected service life of 10 to 15 years. The filter and mounting structures are of sufficient strength to support water, sediment, and debris loads when the filter is full, with no slippage, breaking, or tearing. All filters are warranted for a minimum of five (5) years.

Oil Absorbent Media: The Filter is fitted with an absorbent media for removal of petroleum hydrocarbons from influent, and so placed in the filter assembly to treat influent at rated flow. Absorbent media is easily replaceable in the filter, without the necessity of removing fixed mounting brackets or mounting hardware.

Overflow Protection: The drain filter is designed so that it does not inhibit storm flows entering the curb inlet, or obstruct flow through the catch basin during peak storm flows.

Filter Bypass: Water will not bypass the filter at low flows, nor bypass through attachment and inlet contact surfaces at low flows.

Pollutant Removal Efficiency: The filter is designed to capture high levels of trash and litter, grass and foliage, sediments, hydrocarbons, grease and oil.

POLLUTANT	Curb Inlet Basket
Trash & Litter	90 to 95%
Oil & Grease	54 ³ to 96%*
Sediments/TSS	73 ¹ to 91% ²
Organics	79.3% ²
Total Nitrogen	65 to 96% ³
Total Phosphorus	71 to 96% ³

Non-Scouring: During heavy storm flows or other flows that bypass the filter, the filter screen design prevents washout of debris and floatables in the filter basket.

Filter Removal: The filter basket is readily removable from the mounting/support frame for maintenance or replacement. Removal and replacement of filter screens is accomplished without the necessity of removing mounting bolts, support frames, etc., but by lift out through the manhole.

II. Installation

Installation: The filter will be securely installed in the catch basin or curb inlet opening, with contact surfaces sufficiently joined together so that no filter bypass can occur at low flow. All anchoring devices and fasteners are installed within the interior of the drain inlet. The filter basket is located in the catch basin directly beneath a

manhole opening for direct service/access from the manhole. The filter system provides a shelf system to direct water flow from the inlet to the filter, which is located under the manhole.

Installation Notes:

1. Bio Clean Environmental Services, Inc. inlet filter inserts shall be installed pursuant to the manufacturer's recommendations and the details on this sheet.
2. Inlet filter insert shall provide coverage of entire inlet opening, including inlet wing(s) where applicable, to direct all flow to basket(s).
3. Attachments to inlet walls shall be made of non-corrosive hardware.
4. Filtration basket structure shall be manufactured of marine grade fiberglass, gel coated for ultraviolet protection.
5. Filtration basket fine screen and coarse containment screen shall be manufactured of stainless steel.
6. For inlet filter inserts that include the shelf system, shelf system shall be manufactured of marine grade fiberglass, gel coated for ultraviolet protection.

III. Maintenance

Maintenance: The filter is designed to allow for the use of vacuum removal of captured materials in the filter basket, serviceable by centrifugal compressor vacuum units without causing damage to the filter or any part of the mounting and attachment hardware during normal cleaning and maintenance. Filters can be cleaned and vacuumed from the manhole-opening and not from the curb opening. All filters not accessible from the manhole will be rejected.

Maintenance Notes:

1. Bio Clean Environmental Services, Inc. recommends cleaning and debris removal maintenance a minimum of four times per year, and replacement of hydrocarbon booms a minimum of twice per year.
2. Following maintenance and/or inspection, the maintenance operator shall prepare a maintenance/inspection record. The record shall include any maintenance activities performed, amount and description of debris collected, and condition of filter.
3. The owner shall retain the maintenance/inspection record for a minimum of five years from the date of maintenance. These records shall be made available to the governing municipality for inspection upon request at any time.
4. Any person performing maintenance activities must have completed a minimum of OSHA 24-hour hazardous waste worker (hazwoper) training.
5. Remove manhole lid to gain access to inlet filter insert. Filter basket should be located directly under the manhole lid. Where possible the maintenance should be performed from the ground surface. Note: entry into an underground stormwater vault such as an inlet vault requires certification in confined space training.
6. Remove all trash, debris, organics, and sediments collected by the inlet filter insert basket.
7. Any debris located on the shelf system can be either removed from the shelf or can be pushed into the basket and retrieved from basket.
8. Evaluation of the hydrocarbon boom shall be performed at each cleaning. If the boom is filled with hydrocarbons and oils it should be replaced. Removed boom by cutting plastic ties and remove boom. Attach new boom to basket with plastic ties through pre-drilled holes in basket.
9. Place manhole lid back on manhole opening.
10. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.
11. The hydrocarbon boom is classified as hazardous material and will have to be picked up and disposed of as hazardous waste. Hazardous material can only be handled by a certified hazardous waste trained person (minimum 24-hour hazwoper).

CALIFORNIA CURB SHELF BASKET WATER CLEANSING SYSTEM SAN DIEGO REGIONAL STANDARD CURB INLET

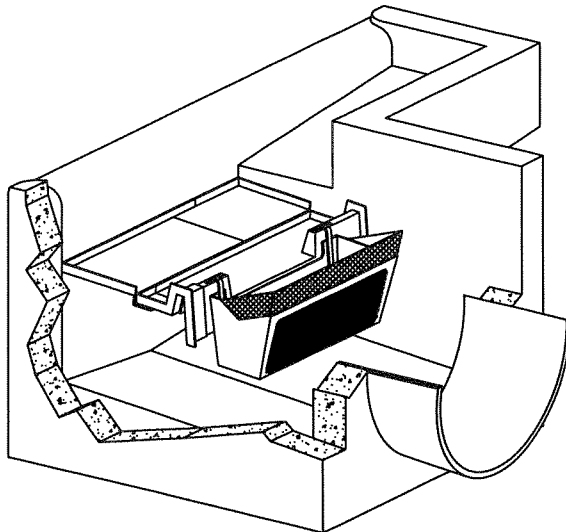


FIGURE 1
DETAIL OF PARTS

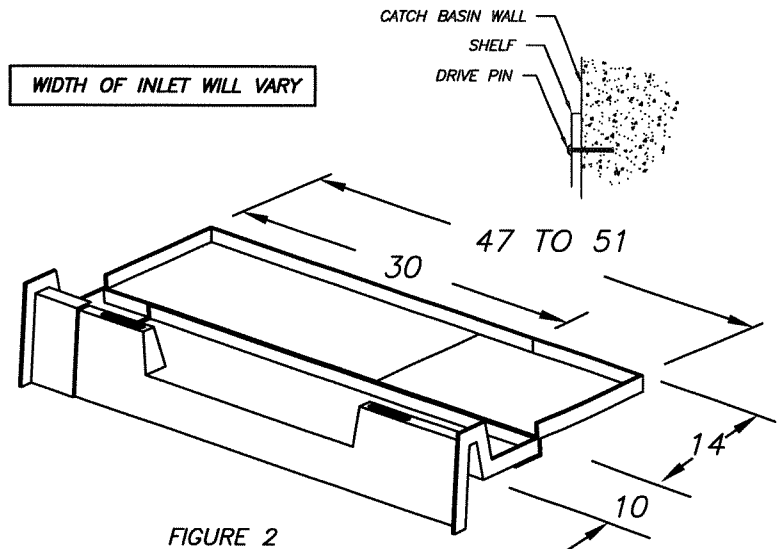


FIGURE 2
DETAIL OF INSTALLATION

REMOVABLE BASKET CATCHES EVERYTHING
AND MAY BE REMOVED THROUGH MANHOLE
WITHOUT ENTRY.

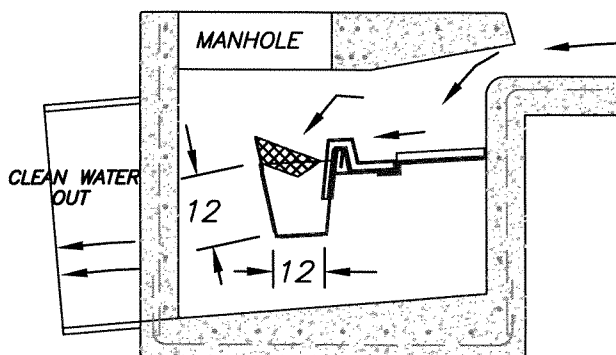


FIGURE 3
DETAIL OF PROCESS

BOX MANUFACTURED FROM
MARINE GRADE FIBERGLASS & GEL
COATED FOR UV PROTECTION

5 YEAR MANUFACTURERS WARRANTY

PATENTED

ALL FILTER SCREENS ARE STAINLESS STEEL

FLOW RATES per 3 FT. Basket				
$Q = SO * c_d * A \sqrt{2 * g * h}$ $c_d = \frac{\text{Coefficient of Discharge}}{\text{Discharge}} = .67$				
	SO	A (ft ²)	h (ft)	Q (ft ³ /s)
Coarse Screen	.62	.84	0.146	1.06
Med Screen	.56	1.36	0.75	3.53
Fine Screen	.68	1.02	1.167	4.01
TOTAL				8.6

The above flow rates are based on unobstructed screens.

NOTES:

- 1.SHELF SYSTEM PROVIDES FOR ENTIRE COVERAGE OF INLET OPENING SO TO DIVERT ALL FLOW TO BASKET.
- 2.SHELF SYSTEM MANUFACTURED FROM MARINE GRADE FIBERGLASS,GEL COATED FOR UV PROTECTION.
- 3.SHELF SYSTEM ATTACHED TO THE CATCH BASIN WITH NON-CORROSIVE HARDWARE.
- 4.FILTRATION BASKET STRUCTURE MANUFACTURED OF MARINE GRADE FIBERGLASS,GEL COATED FOR UV PROTECTION.
- 5.FILTRATION BASKET FINE SCREEN AND COARSE CONTAINMENT SCREEN MANUFACTURED FROM STAINLESS STEEL.
- 6.FILTRATION BASKET HOLDS BOOM OF ABSORBENT MEDIA TO CAPTURE HYDROCARBONS. BOOM IS EASILY REPLACED WITHOUT REMOVING MOUNTING HARDWARE.
- 7.FILTRATION BASKET LOCATION IS DIRECTLY UNDER MANHOLE FOR EASY MAINTENANCE.

EXCLUSIVE CALIFORNIA DISTRIBUTOR:
BIO CLEAN ENVIRONMENTAL SERVICE
P.O. BOX 869, OCEANSIDE, CA. 92049
TEL. 760-433-7640 FAX:760-433-3176
Email: info@biocleanenvironmental.net

SUNTREE QUALITY PRODUCTS ARE BUILT FOR EASY CLEANING AND ARE
DESIGNED TO BE PERMANENT INFRASTRUCTURE AND SHOULD
LAST FOR DECADES.

SUNTREE TECHNOLOGIES 798 CLEARLAKE RD. SUITE #2 COCOA FL. 32922 TEL. 321-637-7552 FAX 321-637-7554		PROJECT:	
CURB INLET BASKET SYSTEM		REVISIONS:	DATE:
DATE: 04/12/04 SCALE: SF = 15		REVISIONS:	DATE:
DRAFTER: N.R.B. UNITS = INCHES		REVISIONS:	DATE:
		REVISIONS:	DATE:

ATTACHMENT F

OPERATION AND MAINTENANCE PROGRAM FOR TREATMENT BMP

*(NOTE: INFORMATION REGARDING OPERATION AND MAINTENANCE CAN BE OBTAINED
FROM THE FOLLOWING WEB SITE:
[HTTP://WWW.SDCOUNTY.CA.GOV/DPW/WATERSHEDS/LAND_DEV/SUSMP.HTML.](http://www.sdcountry.ca.gov/dpw/watersheds/land_dev/susmp.html))*

ATTACHMENT “F”

Permanent BMP Maintenance Program

A schedule of periodic maintenance should be implemented and modified, as needed, to insure effective operation of the indicated permanent site design, source control and treatment BMPs. As a guideline, a tentative schedule of maintenance frequency follows. The schedule is based on certain indicators outlined for a particular BMP. The permanent operation and maintenance of the BMPs for their effective usefulness is the responsibility of the property owner. Actual performance of the operation and maintenance is to be designated by the owner or association.

<u>BMP</u>	<u>ROUTINE ACTIONS</u>	<u>MAINTENANCE INDICATORS</u>	<u>FIELD MEASUREMENT</u>	<u>FREQUENCY</u>	<u>MAINTENANCE ACTIVITY</u>
Vegetated Swale Biofilter Hydroseeding*	Height of vegetation.	Average height of vegetation (grass) exceeds 4”.	Visual inspection of vegetation.	Inspect weekly and after rainy periods.	Cut vegetation as required.
	Assess adequate cover.	Bare spots appear in planted/mulched areas or less than 70% coverage over entire area.	Visual inspection of lack of vegetative/mulch cover. Record locations to identify persistent problem areas.	Assess growth on a monthly basis. Assess mulch coverage on a monthly basis.	Reseed vegetated areas as required. No later than November. Scarify area for reseeding. Reapply mulching as required to cover bare spots.
	Inspect for debris accumulation.	Debris or litter accumulation.	Visual inspection for trash.	During routine site landscape maintenance.	Remove and properly dispose of trash, litter and debris.
	Inspect for accumulation of sediment or erosion of soil.	Sediment is at or near vegetation height. Rills or gullies in topsoil.	Visual inspection for sediment depth. Visual inspection for rills and soil erosion.	Inspect monthly and after each significant rainfall.	Remove accumulated sediment when interfering with drainage flows.
Landscaping & Irrigation	Inspect for overgrown plantings.	Grass longer than 2”. Bushes and shrubs growing into traveled ways. Trees overhanging and interfering with users of walkways, parking spaces or drive aisles.	Visual observation for indicators when landscaping maintenance performed.	Weekly during spring & summer months. Bi-weekly during fall & winter months.	Cut and trim overgrowth as required.
	Inspect for dead or dieing plants.	Indicators vary as to species, but generally are unhealthy looking growth. Browning, drooping branches and leaves.	Visual observation for indicators.	Weekly during spring & summer months. Bi-weekly during fall & winter months.	Remove and replace dead or dieing plantings.
	Inspect for over irrigation.	Oversaturated ground. Standing water in low spots. Excess run-off of irrigation waters.	Visual observation for indicators.	Weekly during spring & summer months. Bi-weekly during fall & winter months.	Adjust timing mechanism for automatic sprinklers. Increase timing between applications. Consider more frequent, shorter operation periods.
	Inspect for over application of fertilizers or pesticides.	Indicators vary as to materials, but generally are burned spots for excessive fertilizer use and sticky residue or staining for over use of pesticides.	Visual observation for indicators.	Weekly during spring & summer months. Bi-weekly during fall & winter months.	Adjust amounts of materials applied. Consider Integrated Pest Management alternatives.
Curb Inlet Basket By Bio-Clean	Inspect for evidence of influent inlet obstructions.	Presence of debris in inlet or reduced inflow volume.	Visual observation for indicators. Standing water in upstream components.	Four times a year. During or immediately after rain event.	Clear debris from inlet.
	Inspect Primary Filter Media for evidence of damaged components.	Weakened or damaged filters. Clean filter cartridge.	Visual observation for indicators. Tactile testing for structural integrity.	Four times a year. During or immediately after rain event.	Repair or replace, as necessary, broken mesh filters.
	Inspect for Filter Media Bag and Hydrocarbon Sock structural integrity.	Presence of debris or sediment in filter sack. Rips or tears in sack material and Hydrocarbon sock.	Visual observation of sediment or debris material nearing capacity of filter sack and integrity of filter sack material.	Four times a year. During or immediately after rain event. Monthly during wet season ⁺ .	Empty and clean filter sack as needed. Replace hydrocarbon booms a minimum of twice per year.
	Inspect for sediment accumulation.	Sediment build-up within sediment filtration area of tank.	Measurement of depth of build-up.	Annually at end of wet season ⁺ .	Remove sediment accumulation with vacuum truck or septic tank cleaner.
	Inspect Trash collector bags for evidence of trash, leaves and other small debris.	Presence of accumulated litter.	Visual observation of maintenance indicators.	Four times a year. During or immediately after rain event.	Clear debris from collector bags and remove and properly dispose of trash, litter and debris.

* - Hydroseeding only required if site not built upon within 90 days after completion of grading operations.

⁺ - “Wet season” is defined as the time period between October 1 and April 30; all other times of the year are considered to be “dry season”.

ATTACHMENT “F”

(Continued)

Permanent BMP Maintenance Program

<u>BMP</u>	<u>ROUTINE ACTIONS</u>	<u>MAINTENANCE INDICATORS</u>	<u>FIELD MEASUREMENT</u>	<u>FREQUENCY</u>	<u>MAINTENANCE ACTIVITY</u>
Integrated Pest Management	Inspect for evidence of undesirable plant species.	Presence of non-native plants or growth, especially in unwanted areas.	Visual observation for indicators.	Seasonally at the minimum. Weekly during spring & summer months.	Remove unwanted species. Replace with native types.
	Inspect for evidence of undesirable insect species.	Presence of non-native or harmful insects. Plant growth destruction.	Visual observation for indicators.	Seasonally at the minimum. Weekly during spring & summer months.	Manage unwanted insects with predatory species or plantings that discourage pest presence. Pesticide use as a last alternative.
	Inspect for evidence of undesirable vertebrate species.	Presence of undesirable animals. Plant growth destruction. Animal scratches on trash dumpsters. Footprints in wet earth, trampled plantings.	Visual observation for indicators. Olfactive presence of animal territory markings.	Weekly during spring & summer months. Seasonally at the minimum.	Manage unwanted animals by eliminating desirable environs. Use of humane traps for relocation. Use poisons as a last alternative.
Storm Drain Signage	Inspect storm drain stencils, signs or placards.	Deteriorating or missing signage.	Visual observation for illegibility or missing signage.	Seasonal observations of signage. More frequently if signage in high traffic areas or subject to adverse conditions.	Repair or replace illegible signage. Replace missing signage.
Pavement Sweeping	Inspect parking areas and drive aisles for accumulation of dirt, dust and debris.	Presence of accumulated litter, piles of debris, piles of dirt or silt rills along storm water flow lines.	Visual observation of maintenance indicators.	Coordinated with municipal street sweeping schedule. Monthly at a minimum. Sweeping should occur during non-traditional business hours.	Utilize properly maintained equipment operated at manufacturer’s recommended optimal speed for effective cleaning. Dispose of wastes in a proper manner at a landfill designated to accept such materials.

* - Hydroseeding only required if site not built upon within 90 days after completion of grading operations.

+ - “Wet season” is defined as the time period between October 1 and April 30; all other times of the year are considered to be “dry season”.

ATTACHMENT “F”

BMP ESTIMATED OPERATION AND MAINTENANCE (O&M) COSTS

Permanent BMPs constructed and installed for this project will necessitate continuous operation and maintenance when the project is complete. O&M costs are based upon California Department of Transportation estimated costs for pilot BMP project utilizing prevailing wage rates. Below are itemized costs, based on prevailing wage rates and knowledge obtained from prior completed projects, of this project’s permanent treatment BMPs.

As identified in SWMP Maintenance Mechanism, by category first and third, the source for funding of BMP operation and maintenance is the responsibility of the property owner/developer and County of San Diego.

A developer fee will be needed to cover the initial maintenance period of two years.

Post construction permanent BMP operation and maintenance costs include, but are not limited to the following:

<u>BMP OPERATION & MAINTENANCE ITEM</u>	<u>LABOR</u>	-	-	<u>EQUIPMENT</u>	-	-	-	<u>MATERIALS</u>	-	TOTAL COST
-	Per Hrs.	Rate	Cost	Type	Days	Rate	Cost	Item	Cost	
POROUS SWALE VEGETATED BIOFILTER	32.0	43.63	\$1,396.16	1 Ton Truck, Hydroseeder	4	48.15	\$192.60	Trimmer, Rake, Fork, Bags, Safety Equipment, Bags, Seed, Testing & Disposal	\$250.00	\$1,838.76
CURB INLET BASKET, BY BIO-CLEAN (2 units)	8	43.63	\$349.04	1 Ton Truck, Vactor Truck, dump trash collector bags, inspect Filter media bag and media	1.0	600.00	\$600.00	Media bags, Zeo, Per, ACAR, Amer 250, Hydrocarbon boom.	\$783.20	\$1,732.24
LANDSCAPING & IRRIGATION	40	43.63	\$1,745.20	1 Ton Truck, Mowers	5.0	34.00	\$170.00	Trimmer, Rake, Fork, Bags, Safety Equipment, Seed,	\$550.00	\$2,465.20
HYDROSEEDING*	12.0	43.63	\$523.56	Hydroseeder, 1 Ton Truck	1.0	48.15	\$48.15	Seed, Binder	\$150.00	\$721.71
									O&M TOTAL	\$6,757.90

FIRST CATEGORY:

THE COUNTY SHOULD HAVE ONLY MINIMAL CONCERN FOR ONGOING MAINTENANCE. THE PROPOSED BMPS INHERENTLY "TAKE CARE OF THEMSELVES", OR PROPERTY OWNERS CAN NATURALLY BE EXPECTED TO DO SO AS AN INCIDENT OF TAKING CARE OF THEIR PROPERTY

TYPICAL BMPS:

BIOFILTERS (GRASS SWALE, GRASS STRIP, VEGETATED BUFFER)
INFILTRATION BMP (BASIN, TRENCH)

MECHANISMS TO ASSURE MAINTENANCE:

1. STORMWATER ORDINANCE REQUIREMENT: THE WPO REQUIRES THIS ONGOING MAINTENANCE. IN THE EVENT THAT THE MECHANISMS BELOW PROVE INEFFECTIVE, OR IN ADDITION TO ENFORCING THOSE MECHANISMS, CIVIL ACTION, CRIMINAL ACTION OR ADMINISTRATIVE CITATION COULD ALSO BE PURSUED FOR VIOLATIONS OF THE ORDINANCE.

2. PUBLIC NUISANCE ABATEMENT: UNDER THE WPO FAILURE TO MAINTAIN A BMP WOULD CONSTITUTE A PUBLIC NUISANCE, WHICH MAY BE ABATED UNDER THE UNIFORM PUBLIC NUISANCE ABATEMENT PROCEDURE. THIS PROVIDES AN ENFORCEMENT MECHANISM ADDITIONAL TO THE ABOVE, AND WOULD ALLOW COSTS OF MAINTENANCE TO BE BILLED TO THE OWNER, A LIEN PLACED ON THE PROPERTY, AND THE TAX COLLECTION PROCESS TO BE USED.

3. NOTICE TO PURCHASERS. SECTION 67.819(E) OF THE WPO REQUIRES DEVELOPERS TO PROVIDE CLEAR WRITTEN NOTIFICATION TO PERSONS ACQUIRING LAND UPON WHICH A BMP IS LOCATED, OR OTHERS ASSUMING A BMP MAINTENANCE OBLIGATION, OF THE MAINTENANCE DUTY.

4. CONDITIONS IN ONGOING LAND USE PERMITS: FOR THOSE APPLICATIONS (LISTED IN SO SECTION 67.804) UPON WHOSE APPROVAL ONGOING CONDITIONS MAY BE IMPOSED, A CONDITION WILL BE ADDED WHICH REQUIRES THE OWNER OF THE LAND UPON WHICH THE STORMWATER FACILITY IS LOCATED TO MAINTAIN THAT FACILITY IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN THE SMP. FAILURE TO PERFORM MAINTENANCE MAY THEN BE ADDRESSED AS A VIOLATION OF THE PERMIT, UNDER THE ORDINANCE GOVERNING THAT PERMIT PROCESS.

5. SUBDIVISION PUBLIC REPORT: TENTATIVE MAP AND TENTATIVE PARCEL MAP APPROVALS WILL BE CONDITIONED TO REQUIRE THAT, PRIOR TO APPROVAL OF A FINAL OR PARCEL MAP, THE SUBDIVIDER SHALL PROVIDE EVIDENCE TO THE DIRECTOR OF PUBLIC WORKS, THAT THE SUBDIVIDER HAS REQUESTED THE CALIFORNIA DEPARTMENT OF REAL ESTATE TO INCLUDE IN THE PUBLIC REPORT TO BE ISSUED FOR THE SALES OF LOTS WITHIN THE SUBDIVISION, A NOTIFICATION REGARDING THE MAINTENANCE REQUIREMENT. (THE REQUIREMENT FOR THIS CONDITION WOULD NOT BE APPLICABLE TO SUBDIVISIONS WHICH ARE EXEMPT FROM REGULATION UNDER THE SUBDIVIDED LANDS ACT, OR FOR WHICH NO PUBLIC REPORT WILL BE ISSUED.)

FUNDING:

NONE REQUIRED.

THIRD CATEGORY:

THE COUNTY NEEDS TO ASSURE ONGOING MAINTENANCE IS HEIGHTENED, TO THE POINT THAT THE COUNTY IS WILLING TO TAKE ON THIS RESPONSIBILITY. A PERMANENT FUNDING MECHANISM NEEDS TO BE ESTABLISHED.

TYPICAL BMPS:

FILTRATION SYSTEMS.

MECHANISMS TO ASSURE MAINTENANCE:

1. DEDICATION OF BMP TO COUNTY: THE DEVELOPER WOULD BE REQUIRED TO DEDICATE THE BMP (AND THE PROPERTY ON WHICH IT IS LOCATED) TO THE COUNTY. THIS COULD BE AN IMMEDIATE DEDICATION, OR FOR CASES WHERE THE COUNTY WOULD NOT WANT TO ASSUME RESPONSIBILITY FOR THE FACILITY FOR SOME TIME (E.G., UNTIL AFTER CONSTRUCTION IS COMPLETED), THEN AN IOD COULD BE USED INSTEAD.

2. COUNTY MAINTENANCE DOCUMENTATION: WHERE THE COUNTY HAS ASSUMED MAINTENANCE RESPONSIBILITY, INTERNAL COUNTY PROGRAM DOCUMENTATION WOULD MEMORIALIZE THE REQUIRED MAINTENANCE.

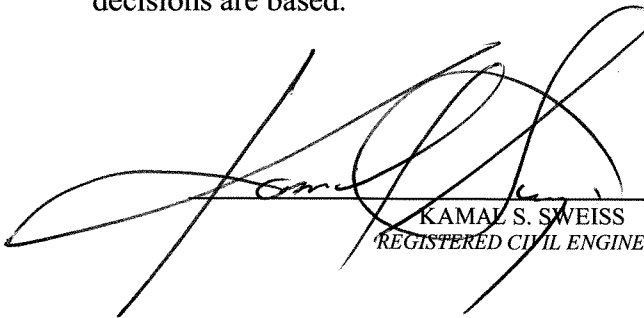
FUNDING:

THE PRIMARY FUNDING MECHANISM WILL BE A SPECIAL ASSESSMENT UNDER THE AUTHORITY OF THE FLOOD CONTROL DISTRICT. THE ASSESSMENT WILL BE COLLECTED WITH PROPERTY TAX. BECAUSE THIS PRIMARY FUNDING MECHANISM WILL REQUIRE SUBSTANTIAL AMOUNT OF TIME TO ESTABLISH AND COLLECT ASSESSMENTS, A DEVELOPER FEE WILL BE NEEDED TO COVER THE INITIAL MAINTENANCE PERIOD OF 24 MONTHS.

ATTACHMENT G

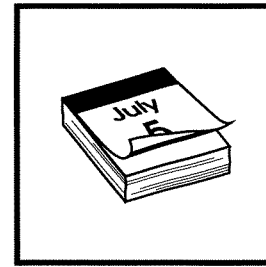
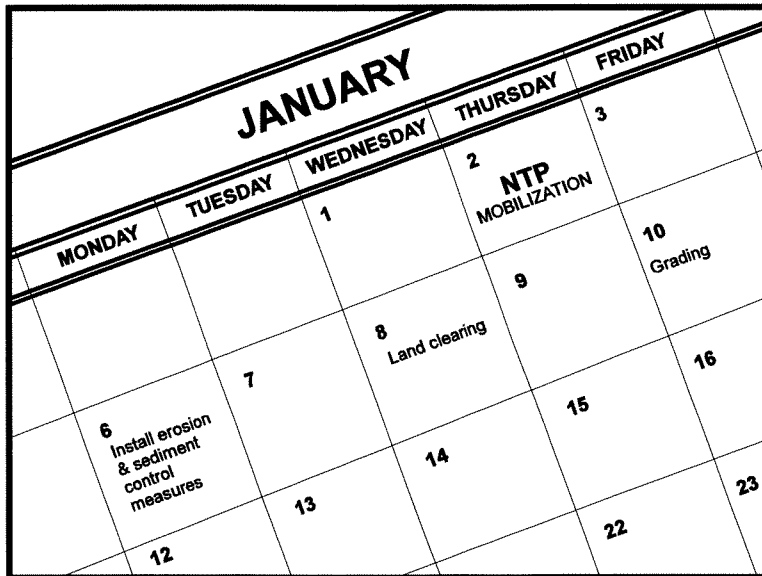
CERTIFICATION SHEET

This Stormwater Management Plan has been prepared under the direction of the following Registered Civil Engineer. The Registered Civil Engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.



KAMAL S. SWEISS
REGISTERED CIVIL ENGINEER

8-28-07
DATE



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose This best management practice (BMP) involves developing, for every project, a schedule that includes sequencing of construction activities with the implementation of construction site BMPs such as temporary soil stabilization (erosion control) and temporary sediment controls measures. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Appropriate Applications Construction sequencing shall be scheduled to minimize land disturbance for all projects during the rainy and non-rainy season. Appropriate BMPs shall be implemented during both rainy and non-rainy seasons.

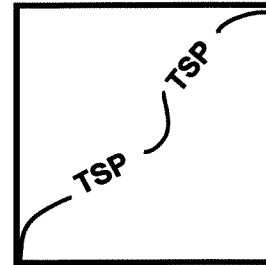
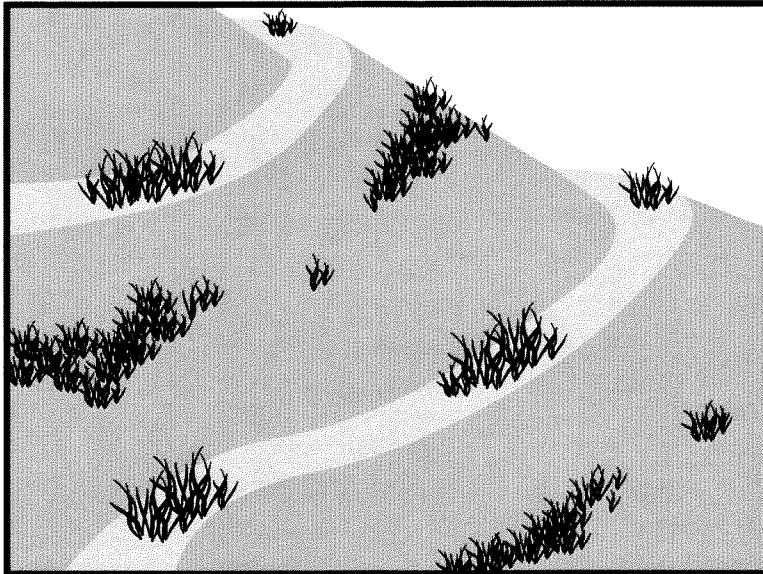
Limitations None identified.

- Standards and Specifications**
- Developing a schedule and planning the project are the very first steps in an effective storm water program. The schedule shall clearly show how the rainy season relates to soil-disturbing and re-stabilization activities. The construction schedule shall be incorporated into the SWPPP or WPCP.
 - The schedule shall include detail on the rainy season implementation and deployment of:
 - Temporary soil stabilization BMPs.
 - Temporary sediment control BMPs.
 - Tracking control BMPs.
 - Wind erosion control BMPs.

- Non-storm water BMPs.
- Waste management and materials pollution control BMPs.
- Schedule shall also include dates for significant long-term operations or activities that may have planned non-storm water discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, bridge cleaning, etc.
- Schedule work to minimize soil disturbing activities during the rainy season.
- Develop the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, pouring foundations, installing utilities, etc., to minimize the active construction area during the rainy season.
- Schedule major grading operations for the non-rainy season when practical.
- Stabilize non-active areas within 14 days from the cessation of soil-disturbing activities or one day prior to the onset of precipitation, whichever occurs first.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment controls and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year-round to deploy soil stabilization and sediment control practices as required by Section 2 of this Manual. Erosion may be caused during dry seasons by unseasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year-round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Sequence trenching activities so that most open portions are closed before new trenching begins.
- Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
- Consider scheduling when establishing permanent vegetation (appropriate planting time for specified vegetation).
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Maintenance and Inspection

- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted or when directed by the Resident Engineer (RE).
- The Special Provisions require annual submittal of a rainy season implementation schedule. Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Hydroseeding typically consists of applying a mixture of wood fiber, seed, fertilizer, and stabilizing emulsion with hydro-mulch equipment, which temporarily protects exposed soils from erosion by water and wind. This is one of five temporary soil stabilization alternatives to consider.

Appropriate Applications

- Hydroseeding is applied on disturbed soil areas requiring temporary protection until permanent vegetation is established or disturbed soil areas that must be re-disturbed following an extended period of inactivity.

Limitations

- Hydroseeding may be used alone only when there is sufficient time in the season to ensure adequate vegetation establishment and erosion control. Otherwise, hydroseeding must be used in conjunction with a soil binder or mulching (i.e., straw mulch), refer to BMP SS-5, Table 1 for options.
- Steep slopes are difficult to protect with temporary seeding.
- Temporary seeding may not be appropriate in dry periods without supplemental irrigation.
- Temporary vegetation may have to be removed before permanent vegetation is applied.
- Temporary vegetation is not appropriate for short-term inactivity.

Standards and Specifications To select appropriate hydroseeding mixtures, an evaluation of site conditions shall be performed with respect to:

- Soil conditions
 - Site topography
 - Season and climate
 - Vegetation types
 - Maintenance requirements
 - Sensitive adjacent areas
 - Water availability
 - Plans for permanent vegetation
- Selection of hydroseeding mixtures shall be approved by the District Landscape Architect and the Construction Storm Water Coordinator.

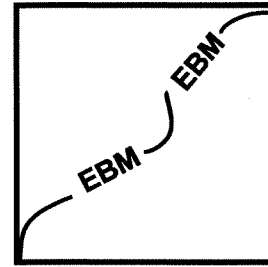
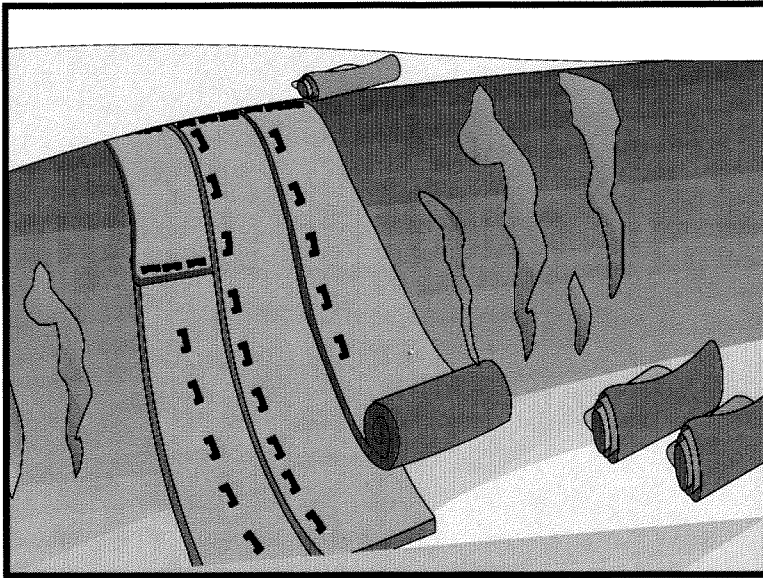
The following steps shall be followed for implementation:

- Seed mix shall comply with the Standard Specifications Section 20-2.10, and the project's special provisions.
- Hydroseeding can be accomplished using a multiple-step or one-step process; refer to the special provisions for specified process. The multiple-step process ensures maximum direct contact of the seeds to soil. When the one-step process is used to apply the mixture of fiber, seed, etc., the seed rate shall be increased to compensate for all seeds not having direct contact with the soil.
- Prior to application, roughen the slope, fill area, or area to be seeded with the furrows trending along the contours. Rolling with a crimping or punching type roller or track walking is required on all slopes prior to hydroseeding. Track walking shall only be used where other methods are impractical.
- Apply a straw mulch to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow, refer to Standard Specifications Sections 20-2.06 and 20-3.03.
- All seeds shall be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag shall be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test; provide the Resident Engineer (RE) with such documentation. The container shall be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed shall be pellet-inoculated. Inoculant sources shall be species-specific and shall be applied at a rate of 2 kg of inoculant per 100 kg of seed (2-lb inoculant per 100-lb seed), refer to Standard Specifications Section 20-2.10.
- Commercial fertilizer shall conform to the requirements of the California Food and Agricultural Code. Fertilizer shall be pelleted or granular form.

- Follow-up applications shall be made as needed to cover weak spots, and to maintain adequate soil protection.
 - Avoid over-spray onto the traveled way, sidewalks, lined drainage channels, and existing vegetation.
- Maintenance and Inspection
- All seeded areas shall be inspected for failures and re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates. Any temporary revegetation efforts that do not provide adequate cover must be reapplied at a scheduled recommended by the Caltrans Landscape Architect or RE.
 - After any rainfall event, the Contractor is responsible for maintaining all slopes to prevent erosion.

Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

SS-7



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose This Best Management Practice (BMP) involves the placement of geotextiles, mats, plastic covers, or erosion control blankets to stabilize disturbed soil areas and protect soils from erosion by wind or water. This is one of five temporary soil stabilization alternatives to consider.

Appropriate Applications These measures are used when disturbed soils may be particularly difficult to stabilize, including the following situations:

- Steep slopes, generally steeper than 1:3 (V:H).
- Slopes where the erosion potential is high.
- Slopes and disturbed soils where mulch must be anchored.
- Disturbed areas where plants are slow to develop.
- Channels with flows exceeding 1.0 m/s (3.3 ft/s).
- Channels to be vegetated.
- Stockpiles.
- Slopes adjacent to water bodies of Environmentally Sensitive Areas (ESAs).

Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

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- Limitations**
- Blankets and mats are more expensive than other erosion control measures, due to labor and material costs. This usually limits their application to areas inaccessible to hydraulic equipment, or where other measures are not applicable, such as channels.
 - Blankets and mats are generally not suitable for excessively rocky sites, or areas where the final vegetation will be mowed (since staples and netting can catch in mowers).
 - Blankets and mats must be removed and disposed of prior to application of permanent soil stabilization measures.
 - Plastic sheeting is easily vandalized, easily torn, photodegradable, and must be disposed of at a landfill.
 - Plastic results in 100% runoff, which may cause serious erosion problems in the areas receiving the increased flow.
 - The use of plastic shall be limited to covering stockpiles, or very small graded areas for short periods of time (such as through one imminent storm event), until alternative measures, such as seeding and mulching, may be installed.
 - Geotextiles, mats, plastic covers, and erosion control covers have maximum flow rate limitations; consult the manufacturer for proper selection.

Standards and Specifications **Material Selection**

There are many types of erosion control blankets and mats, and selection of the appropriate type shall be based on the specific type of application and site conditions. Selection(s) made by the Contractor must be approved by the Resident Engineer (RE); certification of compliance shall be in accordance with Standard Specifications Section 6-1.07.

Geotextiles

- Material shall be a woven polypropylene fabric with minimum thickness of 1.5 mm (0.06 inch), minimum width of 3.7 m (12 ft) and shall have minimum tensile strength of 0.67 kN (warp) 0.36 kN (fill) in conformance with the requirements in ASTM Designation: D 4632. The permittivity of the fabric shall be approximately 0.07 sec –1 in conformance with the requirements in ASTM Designation: D4491. The fabric shall have an ultraviolet (UV) stability of 70 percent in conformance with the requirements in ASTM designation: D4355. Geotextile blankets shall be secured in place with wire staples or sandbags and by keying into tops of slopes and edges to prevent infiltration of surface waters under Geotextile. Staples shall be made of 3.05-mm (0.12-inch) steel wire and shall be U-shaped with 200-mm (8-inch) legs and 50-mm (2-inch) crown.
- Geotextiles may be reused if, in the opinion of the RE, they are suitable for the use intended.



Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

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Plastic Covers

- Plastic sheeting shall have a minimum thickness of 6 mil, and shall be keyed in at the top of slope and firmly held in place with sandbags or other weights placed no more than 3 m (10 ft) apart. Seams are typically taped or weighted down their entire length, and there shall be at least a 300 mm to 600 mm (12 to 24 inches) overlap of all seams. Edges shall be embedded a minimum of 150 mm (6 inches) in soil.
- All sheeting shall be inspected periodically after installation and after significant rainstorms to check for erosion, undermining, and anchorage failure. Any failures shall be repaired immediately. If washout or breakages occurs, the material shall be re-installed after repairing the damage to the slope.

Erosion Control Blankets/Mats

- Biodegradable rolled erosion control products (RECPs) are typically composed of jute fibers, curled wood fibers, straw, coconut fiber, or a combination of these materials. For an RECP to be considered 100% biodegradable, the netting, sewing or adhesive system that holds the biodegradable mulch fibers together must also be biodegradable.
 - **Jute** is a natural fiber that is made into a yarn, which is loosely woven into a biodegradable mesh. It is designed to be used in conjunction with vegetation and has longevity of approximately one year. The material is supplied in rolled strips, which shall be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.
 - **Excelsior (curled wood fiber)** blanket material shall consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 150 mm (6 inches) or longer. The excelsior blanket shall be of consistent thickness. The wood fiber shall be evenly distributed over the entire area of the blanket. The top surface of the blanket shall be covered with a photodegradable extruded plastic mesh. The blanket shall be smolder resistant without the use of chemical additives and shall be non-toxic and non-injurious to plant and animal life. Excelsior blanket shall be furnished in rolled strips, a minimum of 1220 mm (48 inches) wide, and shall have an average weight of 0.5 kg/m² (12 lb/ft²), ± 10 percent, at the time of manufacture. Excelsior blankets shall be secured in place with wire staples. Staples shall be made of 3.05-mm (0.12 inch) steel wire and shall be U-shaped with 200-mm (8-inch) legs and 50-mm (2-inch) crown.



Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

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- **Straw blanket** shall be machine-produced mats of straw with a lightweight biodegradable netting top layer. The straw shall be attached to the netting with biodegradable thread or glue strips. The straw blanket shall be of consistent thickness. The straw shall be evenly distributed over the entire area of the blanket. Straw blanket shall be furnished in rolled strips a minimum of 2 m (6.5 ft) wide, a minimum of 25 m (80 ft) long and a minimum of 0.27 kg/m² (6.4 lb/ft²). Straw blankets shall be secured in place with wire staples. Staples shall be made of 3.05-mm (0.12 inch) steel wire and shall be U-shaped with 200-mm (8-inch) legs and 50-mm (2-inch) crown.
- **Wood fiber blanket** is composed of biodegradable fiber mulch with extruded plastic netting held together with adhesives. The material is designed to enhance revegetation. The material is furnished in rolled strips, which shall be secured to the ground with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Coconut fiber blanket** shall be machine-produced mats of 100% coconut fiber with biodegradable netting on the top and bottom. The coconut fiber shall be attached to the netting with biodegradable thread or glue strips. The coconut fiber blanket shall be of consistent thickness. The coconut fiber shall be evenly distributed over the entire area of the blanket. Coconut fiber blanket shall be furnished in rolled strips with a minimum of 2 m (6.5 ft) wide, a minimum of 25 m (80 ft) long and a minimum of 0.27-kg/m² (6.4 lb/ft²). Coconut fiber blankets shall be secured in place with wire staples. Staples shall be made of 3.05-mm (0.12 inch) steel wire and shall be U-shaped with 200-mm (8-inch) legs and 50-mm (2-inch) crown.
- **Coconut fiber mesh** is a thin permeable membrane made from coconut or corn fiber that is spun into a yarn and woven into a biodegradable mat. It is designed to be used in conjunction with vegetation and typically has longevity of several years. The material is supplied in rolled strips, which shall be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Straw coconut fiber blanket** shall be machine-produced mats of 70% straw and 30% coconut fiber with a biodegradable netting top layer and a biodegradable bottom net. The straw and coconut fiber shall be attached to the netting with biodegradable thread or glue strips. The straw coconut fiber blanket shall be of consistent thickness. The straw and coconut fiber shall be evenly distributed over the entire area of the blanket. Straw coconut fiber blanket shall be furnished in rolled strips a minimum of 2 m (6.5 ft) wide, a minimum of 25 m (80 ft) long and a minimum of 0.27 kg/m² (6.4 lb/ft²). Straw coconut fiber blankets shall be secured in place with wire staples. Staples shall be made of 3.05-mm (0.12-inch) steel wire and shall be U-shaped with 200-mm (8-inch) legs and 50-mm (2-inch) crown.



Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

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- Non-biodegradable RECPs are typically composed of polypropylene, polyethylene, nylon or other synthetic fibers. In some cases, a combination of biodegradable and synthetic fibers is used to construct the RECP. Netting used to hold these fibers together is typically non-biodegradable as well.
- **Plastic netting** is a lightweight biaxially-oriented netting designed for securing loose mulches like straw to soil surfaces to establish vegetation. The netting is photodegradable. The netting is supplied in rolled strips, which shall be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Plastic mesh** is an open-weave geotextile that is composed of an extruded synthetic fiber woven into a mesh with an opening size of less than 0.5 cm (0.2 inch). It is used with revegetation or may be used to secure loose fiber such as straw to the ground. The material is supplied in rolled strips, which shall be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Synthetic fiber with netting** is a mat that is composed of durable synthetic fibers treated to resist chemicals and ultraviolet light. The mat is a dense, three-dimensional mesh of synthetic (typically polyolefin) fibers stitched between two polypropylene nets. The mats are designed to be revegetated and provide a permanent composite system of soil, roots, and geomatrix. The material is furnished in rolled strips, which shall be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Bonded synthetic fibers** consist of a three-dimensional geomatrix nylon (or other synthetic) matting. Typically it has more than 90% open area, which facilitates root growth. Its tough root-reinforcing system anchors vegetation and protects against hydraulic lift and shear forces created by high volume discharges. It can be installed over prepared soil, followed by seeding into the mat. Once vegetated, it becomes an invisible composite system of soil, roots, and geomatrix. The material is furnished in rolled strips that shall be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Combination synthetic and biodegradable RECPs** consist of biodegradable fibers, such as wood fiber or coconut fiber, with a heavy polypropylene net stitched to the top and a high-strength continuous-filament geomatrix or net stitched to the bottom. The material is designed to enhance revegetation. The material is furnished in rolled strips, which shall be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.



Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

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Site Preparation

- Proper site preparation is essential to ensure complete contact of the blanket or matting with the soil.
- Grade and shape the area of installation.
- Remove all rocks, clods, vegetation or other obstructions so that the installed blankets or mats will have complete, direct contact with the soil.
- Prepare seedbed by loosening 50 mm (2 in) to 75 mm (3 in) of topsoil.

Seeding

Seed the area before blanket installation for erosion control and revegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket installation, all check slots and other areas disturbed during installation must be re-seeded. Where soil filling is specified, seed the matting and the entire disturbed area after installation and prior to filling the mat with soil.

Anchoring

- U-shaped wire staples, metal geotextile stake pins or triangular wooden stakes can be used to anchor mats and blankets to the ground surface.
- Staples shall be made of 3.05 mm (0.12 inch) steel wire and shall be U-shaped with 200-mm (8-inch) legs and 50-mm (2-inch) crown.
- Metal stake pins shall be 5 mm (0.188 in) diameter steel with a 40 mm (1.5 in) steel washer at the head of the pin.
- Wire staples and metal stakes shall be driven flush to the soil surface.
- All anchors shall be 150 mm (6 in) to 450 mm (18 in) long and have sufficient ground penetration to resist pullout. Longer anchors may be required for loose soils.

Installation on Slopes

Installation shall be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Begin at the top of the slope and anchor the blanket in a 150 mm (6 in) deep by 150 mm (6 in) wide trench. Backfill trench and tamp earth firmly.
- Unroll blanket downslope in the direction of water flow.



Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

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- Overlap the edges of adjacent parallel rolls 50 mm (2 in) to 75 mm (3 in) and staple every 1 m (3 ft).
- When blankets must be spliced, place blankets end over end (shingle style) with 150 mm (6 in) overlap. Staple through overlapped area, approximately 300 mm (12 in) apart.
- Lay blankets loosely and maintain direct contact with the soil. Do not stretch.
- Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Staples shall be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 (V:H) to 1:2 (V:H), require a minimum of 2 staples/m² (2 staples/yd²). Moderate slopes, 1:2 (V:H) to 1:3 (V:H), require a minimum of 1½ staples/m² (1 ½ staples/yd²), placing 1 staple/m (1 staple/yd) on centers. Gentle slopes require a minimum of 1 staple/m² (1 staple/yd²).

Installation in Channels

Installation shall be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Dig initial anchor trench 300 mm (12 in) deep and 150 mm (6 in) wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 150 mm (6 in) deep and 150 mm (6 in) wide across the channel at 8 m to 10 m (25 ft to 30 ft) intervals along the channels.
- Cut longitudinal channel anchor slots 100 mm (4 in) deep and 100 mm (4 in) wide along each side of the installation to bury edges of matting, whenever possible extend matting 50 mm (2 in) to 75 mm (3 in) above the crest of the channel side slopes.
- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 300 mm (12 in) intervals. Note: matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 75 mm (3 in).
- Secure these initial ends of mats with anchors at 300 mm (12 in) intervals, backfill and compact soil.
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench. Unroll adjacent mats upstream in similar fashion, maintaining a 75 mm (3 in) overlap.



Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

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- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 300 mm (12 in) intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.
- Alternate method for non-critical installations: Place two rows of anchors on 150 mm (6 in) centers at 8 m (25 ft) to 10 m (30 ft) intervals in lieu of excavated check slots.
- Shingle-lap spliced ends by a minimum of 300 mm (12 in) apart on 300 mm (12 in) intervals.
- Place edges of outside mats in previously excavated longitudinal slots, anchor using prescribed staple pattern, backfill and compact soil.
- Anchor, fill and compact upstream end of mat in a 300 mm (12 in) by 150 mm (6 in) terminal trench.
- Secure mat to ground surface using U-shaped wire staples, geotextile pins, or wooden stakes.
- Seed and fill turf reinforcement matting with soil, if specified.

Soil Filling (if specified for turf reinforcement)

- Always consult the manufacturer's recommendations for installation.
- Do not drive tracked or heavy equipment over mat.
- Avoid any traffic over matting if loose or wet soil conditions exist.
- Use shovels, rakes or brooms for fine grading and touch up.
- Smooth out soil filling, just exposing top netting of mat.

Temporary Soil Stabilization Removal

- When no longer required for the work, temporary soil stabilization shall become the property of the Contractor. Temporary soil stabilization removed from the site of the work shall be disposed of outside the highway right-of-way in conformance with the provisions in Standard Specifications Section 7-1.13. If approved by the RE, the contractor may leave the temporary soil stabilizer in place.



Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

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Maintenance and Inspection

Areas treated with temporary soil stabilization shall be inspected as specified in the special provisions. Areas treated with temporary soil stabilization shall be maintained to provide adequate erosion control. Temporary soil stabilization shall be reapplied or replaced on exposed soils when area becomes exposed or exhibits visible erosion.

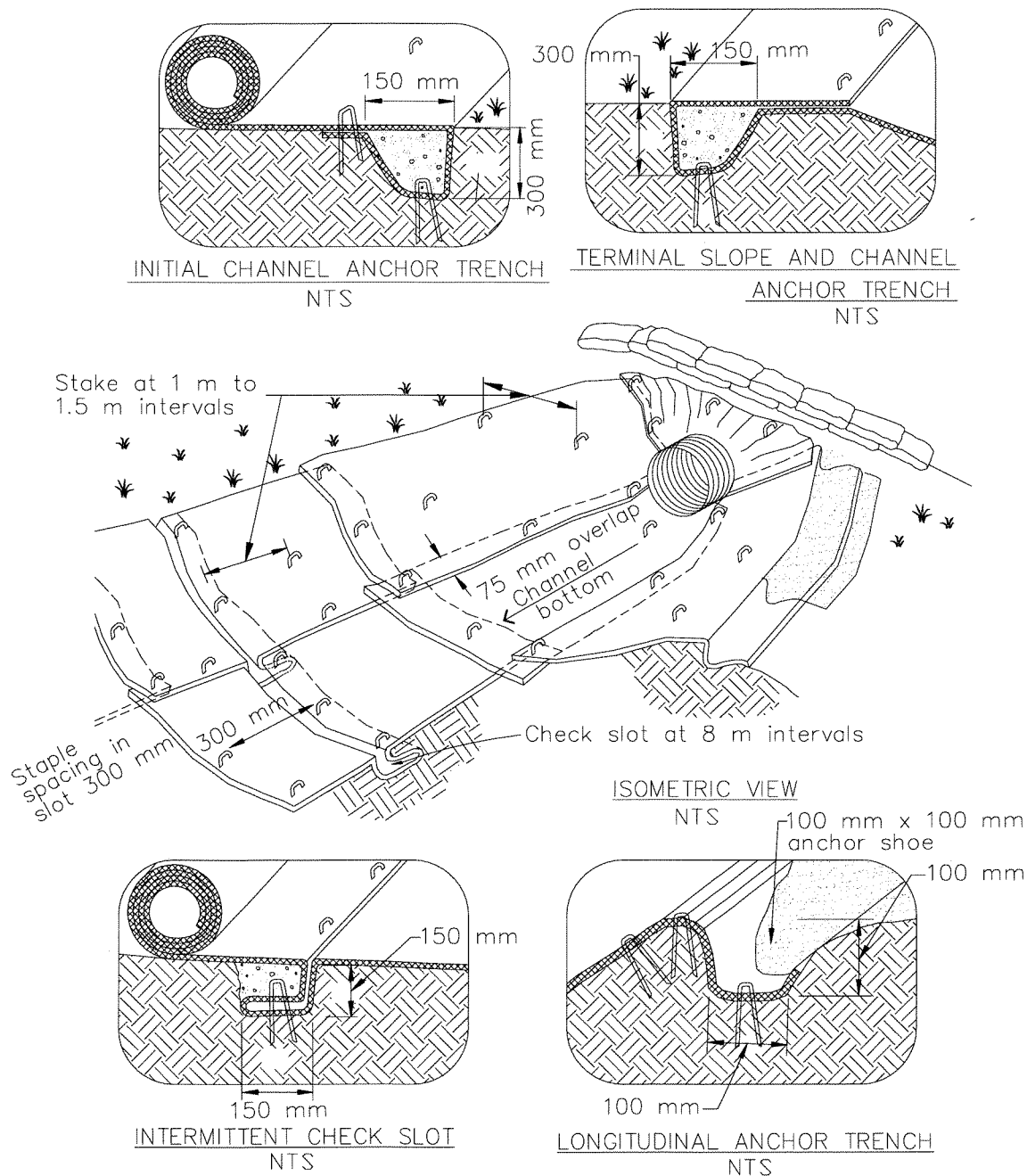
- All blankets and mats shall be inspected periodically after installation.
- Installation shall be inspected after significant rain storms to check for erosion and undermining. Any failures shall be repaired immediately.
- If washout or breakage occurs, re-install the material after repairing the damage to the slope or channel.



Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

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Typical Installation Detail



NOTES:

1. Check slots to be constructed per manufacturers specifications.
2. Staking or stapling layout per manufacturers specifications.
3. Install per manufacturer's recommendations

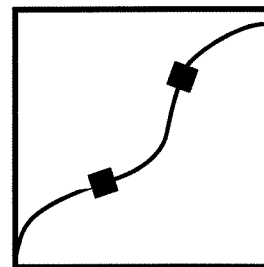
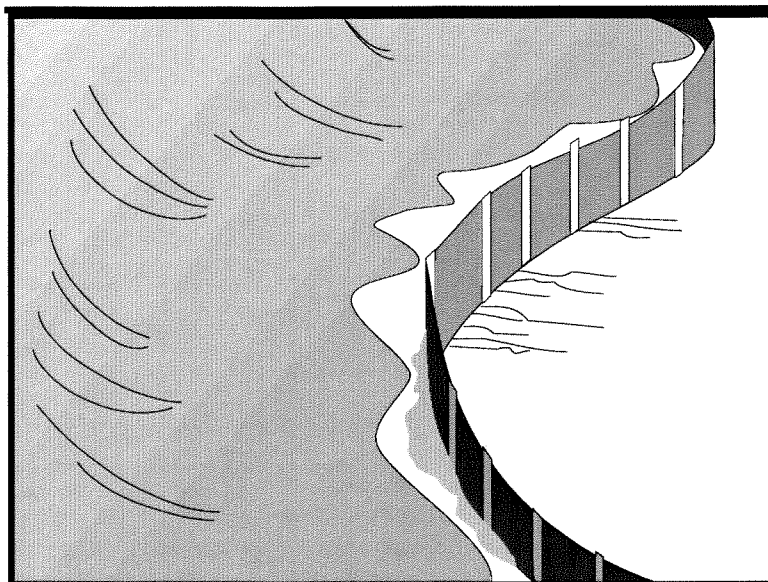
SS-7

The image contains two technical diagrams. The top diagram is an isometric view of a typical slope stabilization method. It shows a cross-section of a slope with a berm at the top. A 1.2 m wide anchor trench is shown, containing a 150 mm x 150 mm anchor. The slope is labeled with a 1:2 (V:H) ratio and a maximum height of 2 m. The bottom diagram is an isometric view of a wet slope lining method. It shows a slope with a water table indicated by a dashed line. A filter cloth is installed 1.2 m above the source of water. A non-woven geotextile filter fabric is shown under a typical treatment. The slope is labeled with a 1:2 (V:H) ratio and a maximum height of 2 m. The diagrams include various dimensions and labels for components like mats/blankets, anchor trenches, and filter cloths.

**ISOMETRIC VIEW
TYPICAL SLOPE
SOIL STABILIZATION**
NTS

WET SLOPE LINING
NTS

1. Slope surface shall be free of rocks, clods, sticks and grass. Mats/blankets shall have good soil contact.
2. Lay blankets loosely and stake or staple to maintain direct contact with the soil. Do not stretch.
3. Install per manufacturer's recommendations



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose A silt fence is a temporary linear sediment barrier of permeable fabric designed to intercept and slow the flow of sediment-laden sheet flow runoff. Silt fences allow sediment to settle from runoff before water leaves the construction site.

Appropriate Applications Silt fences are placed:

- Below the toe of exposed and erodible slopes.
- Down-slope of exposed soil areas.
- Around temporary stockpiles.
- Along streams and channels.
- Along the perimeter of a project.

Limitations

- Not effective unless trenched and keyed in.
- Not intended for use as mid-slope protection on slopes greater than 1:4 (V:H).
- Must be maintained.
- Must be removed and disposed of.
- Don't use below slopes subject to creep, slumping, or landslides.
- Don't use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Don't use silt fences to divert flow.

Standards and Specifications *Design and Layout*

- The maximum length of slope draining to any point along the silt fence shall be 61 m (200 ft) or less.
- Slope of area draining to silt fence shall be less than 1:1 (V:H).
- Limit to locations suitable for temporary ponding or deposition of sediment.
- Fabric life span generally limited to between five and eight months. Longer periods may require fabric replacement.
- Silt fences shall not be used in concentrated flow areas.
- Lay out in accordance with Pages 5 and 6 of this BMP.
- For slopes steeper than 1:2 (V:H) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to water bodies or Environmentally Sensitive Areas (ESAs), additional temporary soil stabilization BMPs shall be used.

Materials

- Silt fence fabric shall be woven polypropylene with a minimum width of 900 mm (36 inches) and a minimum tensile strength of 0.45-kN. The fabric shall conform to the requirements in ASTM designation D4632 and shall have an integral reinforcement layer. The reinforcement layer shall be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric shall be between 0.1 sec^{-1} and 0.15 sec^{-1} in conformance with the requirements in ASTM designation D4491. Contractor must submit certificate of compliance in accordance with Standard Specifications Section 6-1.07.
- Wood stakes shall be commercial quality lumber of the size and shape shown on the plans. Each stake shall be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.
- Bar reinforcement may be used, and its size shall be equal to a number four (4) or greater. End protection shall be provided for any exposed bar reinforcement.
- Staples used to fasten the fence fabric to the stakes shall be not less than 45 mm (1.75 inches) long and shall be fabricated from 1.57 mm (0.06 inch) or heavier wire. The wire used to fasten the tops of the stakes together when

joining two sections of fence shall be 3.05 mm (0.12 inch) or heavier wire. Galvanizing of the fastening wire is not required.

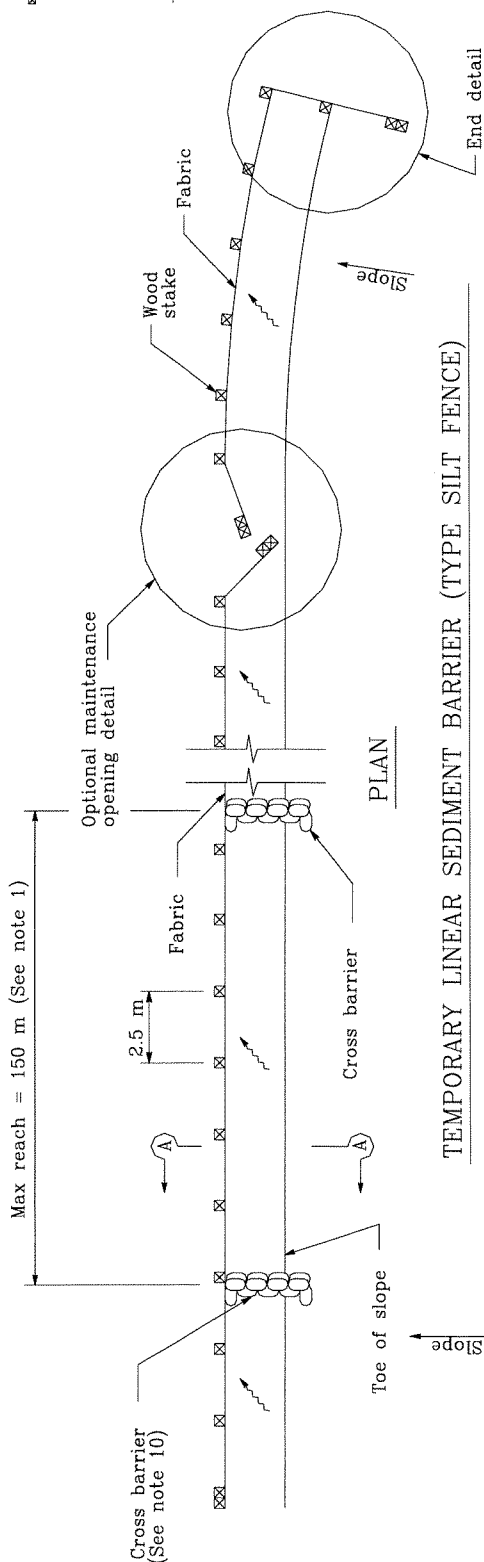
Installation

- Generally, silt fences shall be used in conjunction with soil stabilization source controls up slope to provide effective erosion and sediment control.
- Bottom of the silt fence shall be keyed-in a minimum of 150 mm (12 inches).
- Trenches shall not be excavated wider and deeper than necessary for proper installation of the temporary linear sediment barriers.
- Excavation of the trenches shall be performed immediately before installation of the temporary linear sediment barriers.
- Construct silt fences with a set-back of at least 1m (3 ft) from the toe of a slope. Where a silt fence is determined to be not practical due to specific site conditions, the silt fence may be constructed at the toe of the slope, but shall be constructed as far from the toe of the slope as practical.
- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case shall the reach exceed 150 meters (490 ft).
- Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
- Install in accordance with Pages 5 and 6 of this BMP.

Maintenance and Inspection

- Repair undercut silt fences.
- Repair or replace split, torn, slumping, or weathered fabric.
- Inspect silt fence when rain is forecast. Perform necessary maintenance, or maintenance required by the Resident Engineer (RE).
- Inspect silt fence following rainfall events. Perform maintenance as necessary, or as required by the RE.
- Maintain silt fences to provide an adequate sediment holding capacity. Sediment shall be removed when the sediment accumulation reaches one-third (1/3) of the barrier height. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the right-of-way in conformance with the Standard Specifications.
- Silt fences that are damaged and become unsuitable for the intended purpose, as determined by the RE, shall be removed from the site of work, disposed of outside the highway right-of-way in conformance with the Standard Specifications, and replaced with new silt fence barriers.

- Holes, depressions or other ground disturbance caused by the removal of the temporary silt fences shall be backfilled and repaired in conformance with the Standard Specifications.
- Remove silt fence when no longer needed or as required by the RE. Fill and compact post holes and anchorage trench, remove sediment accumulation, and grade fence alignment to blend with adjacent ground.



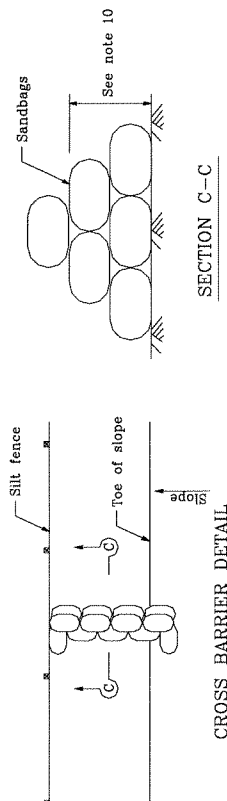
TEMPORARY LINEAR SEDIMENT BARRIER (TYPE SILT FENCE)

NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 150m.
2. The last 2.5 m of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 2.5 m maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow-through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.

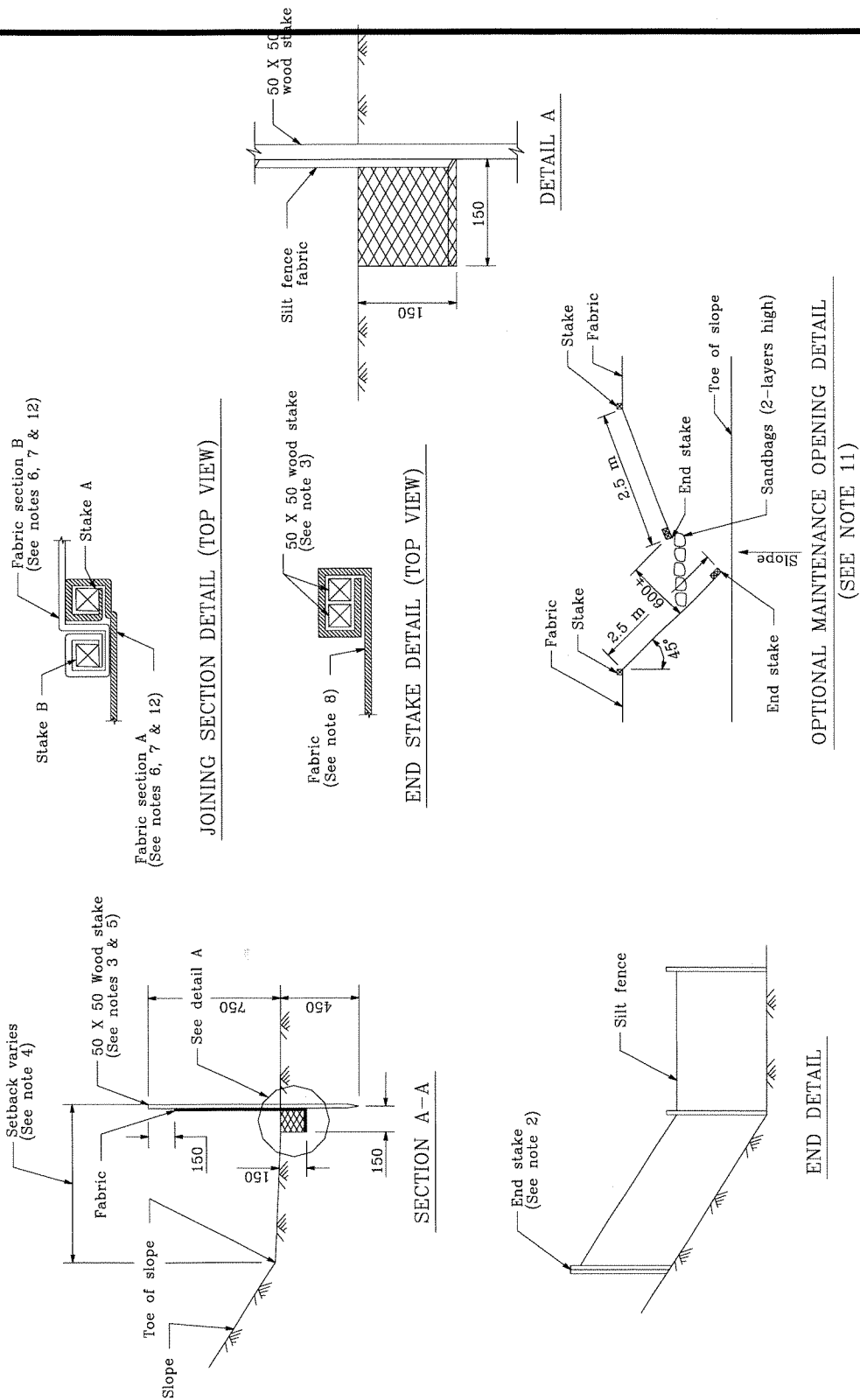
LEGEND

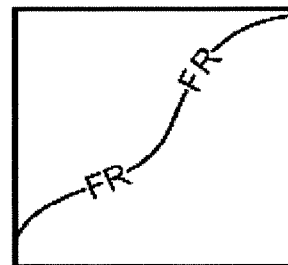
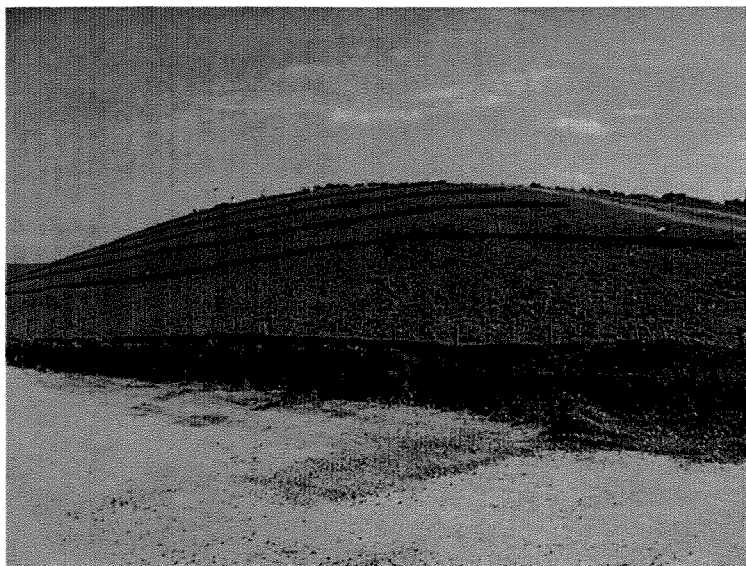
- Tamped backfill
- Slope direction
- Direction of flow



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
TEMPORARY LINEAR SEDIMENT BARRIER
(TYPE SILT FENCE)

NO SCALE
ALL DIMENSIONS ARE IN
MILLIMETERS UNLESS OTHERWISE SHOWN





Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

A fiber roll consists of wood excelsior, rice or wheat straw, or coconut fibers that is rolled or bound into a tight tubular roll and placed on the toe and face of slopes to intercept runoff, reduce its flow velocity, release the runoff as sheet flow and provide removal of sediment from the runoff. Fiber rolls may also be used for inlet protection and as check dams under certain situations.

Appropriate Applications

- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the RE.
- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- Below the toe of exposed and erodible slopes.
- Fiber rolls may be used as check dams in unlined ditches if approved by the Resident Engineer (RE) or the District Construction Storm Water Coordinator (refer to SC-4 "Check Dams").
- Fiber rolls may be used for drain inlet protection if approved by the RE or the District Construction Storm Water Coordinator (refer to SC-10 "Storm Drain Inlet Protection").
- Down-slope of exposed soil areas.
- Around temporary stockpiles.
- Along the perimeter of a project.

- Limitations**
- Runoff and erosion may occur if fiber roll is not adequately trenched in.
 - Fiber rolls at the toe of slopes greater than 1:5 may require the use of 500 mm (20" diameter) or installations achieving the same protection (i.e., stacked smaller diameter fiber rolls, etc.).
 - Fiber rolls may be used for drainage inlet protection if they can be properly anchored.
 - Difficult to move once saturated.
 - Fiber rolls could be transported by high flows if not properly staked and trenched in.
 - Fiber rolls have limited sediment capture zone.
 - Do not use fiber rolls on slopes subject to creep, slumping, or landslide.

Standards and Specifications

Fiber Roll Materials

- Fiber rolls shall be either:
 - (1) Prefabricated rolls.
 - (2) Rolled tubes of erosion control blanket.

Assembly of Field Rolled Fiber Roll

- Roll length of erosion control blanket into a tube of minimum 200 mm (8 in) diameter.
- Bind roll at each end and every 1.2 m (4 ft) along length of roll with jute-type twine.

Installation

- Slope inclination of 1:4 or flatter: fiber rolls shall be placed on slopes 6.0 m apart.
- Slope inclination of 1:4 to 1:2: fiber rolls shall be placed on slopes 4.5 m apart.
- Slope inclination 1:2 or greater: fiber rolls shall be placed on slopes 3.0 m apart.
- Stake fiber rolls into a 50 to 100 mm (2 to 4 in) trench.

- Drive stakes at the end of each fiber roll and spaced 600 mm (2 ft) apart if Type 2 installation is used (refer to Page 4). Otherwise, space stakes 1.2 m (4 ft) maximum on center if installed as shown on Pages 5 and 6.
- Use wood stakes with a nominal classification of 19 by 19 mm (3/4 by 3/4 in), and minimum length of 600 mm (24 in).
- If more than one fiber roll is placed in a row, the rolls shall be overlapped; not abutted.

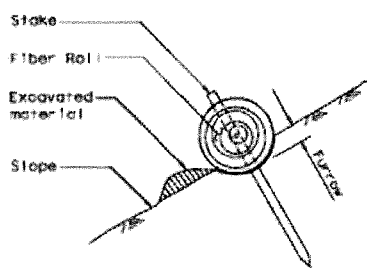
Removal

- Fiber rolls are typically left in place.
- If fiber rolls are removed, collect and dispose of sediment accumulation, and fill and compact holes, trenches, depressions or any other ground disturbance to blend with adjacent ground.

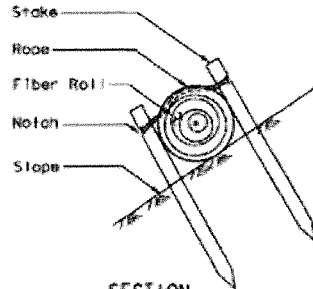
Maintenance and Inspection

- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- Inspect fiber rolls when rain is forecast. Perform maintenance as needed or as required by the RE.
- Inspect fiber rolls following rainfall events and at least daily during prolonged rainfall. Perform maintenance as needed or as required by the RE.
- Maintain fiber rolls to provide an adequate sediment holding capacity. Sediment shall be removed when the sediment accumulation reaches three quarters (3/4) of the barrier height. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications.

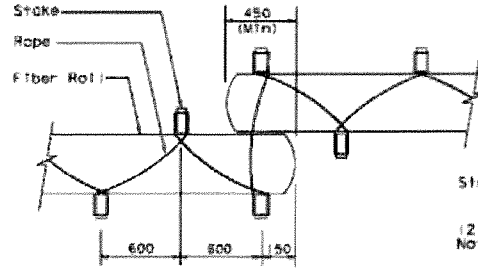
Fiber Rolls



SECTION
TEMPORARY FIBER ROLL
(TYPE 1)



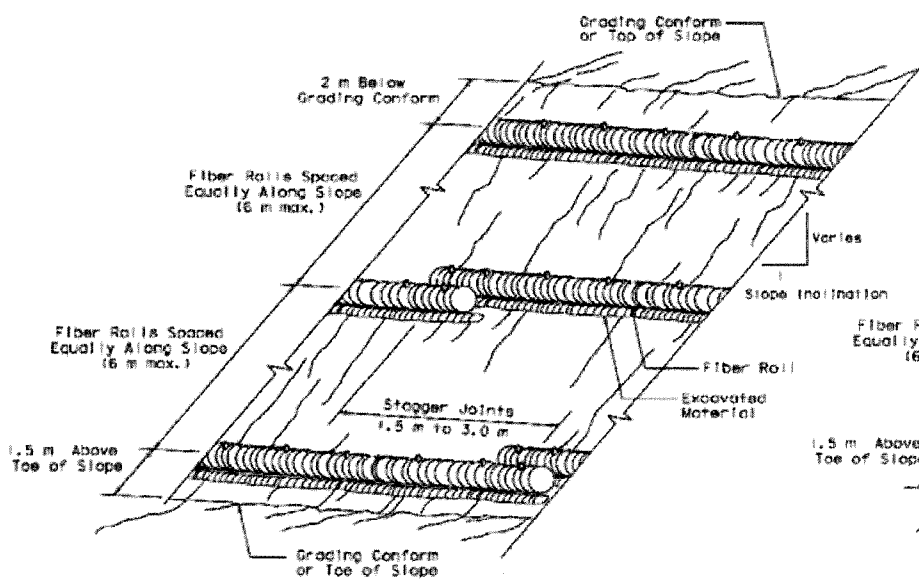
SECTION
TEMPORARY FIBER ROLL
(TYPE 2)



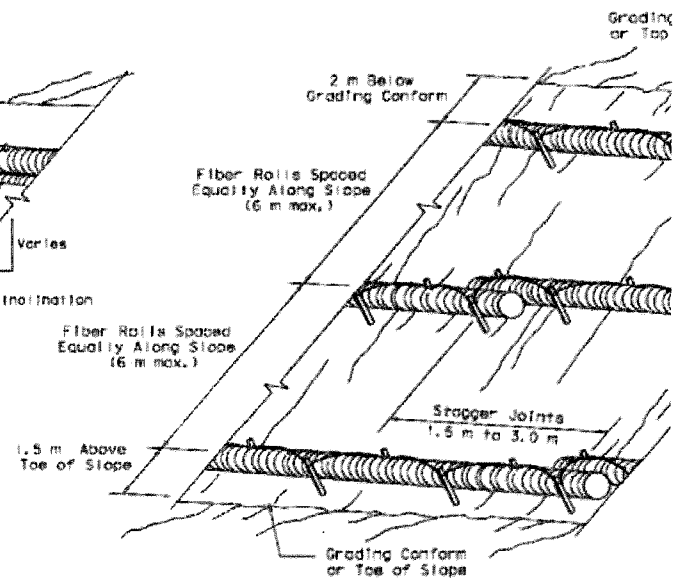
PLAN



ELEVATION
NOTCH DETAIL

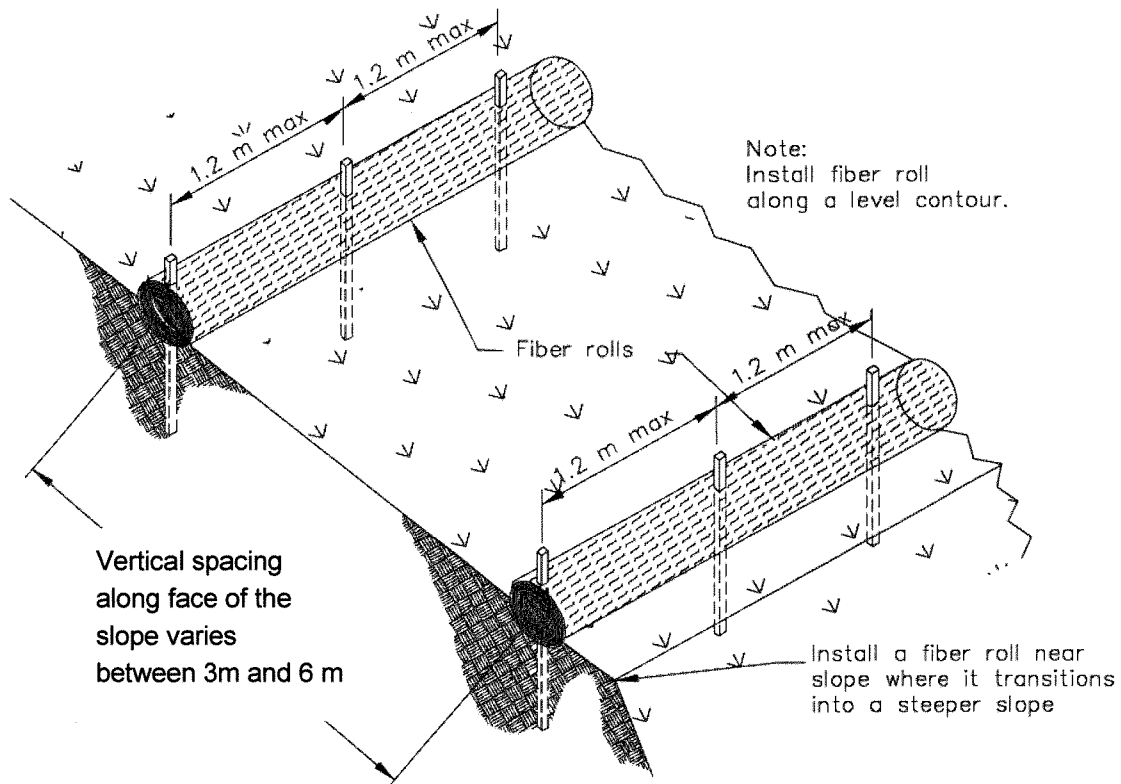


PERSPECTIVE
TEMPORARY FIBER ROLL (TYPE 1)

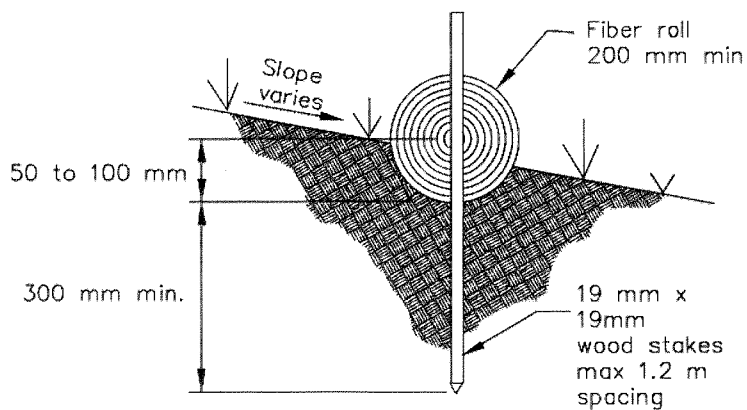


PERSPECTIVE
TEMPORARY FIBER ROLL (TYPE 2)

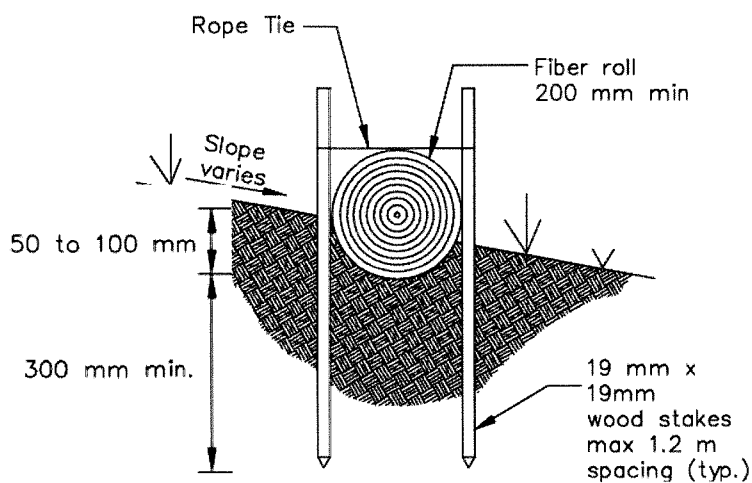
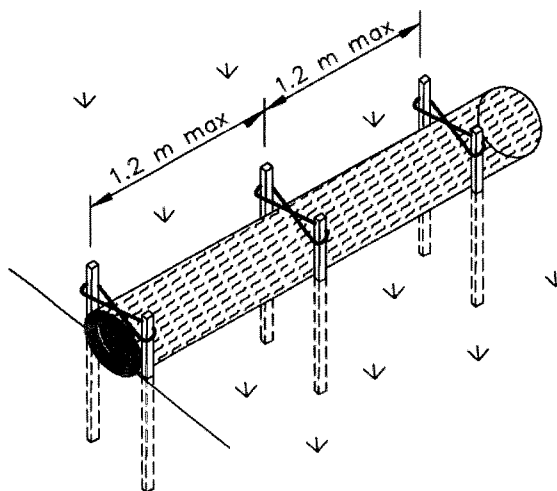




TYPICAL FIBER ROLL INSTALLATION
N.T.S.

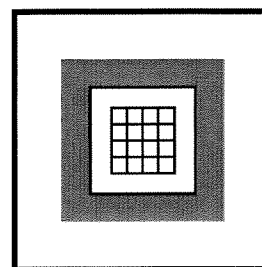
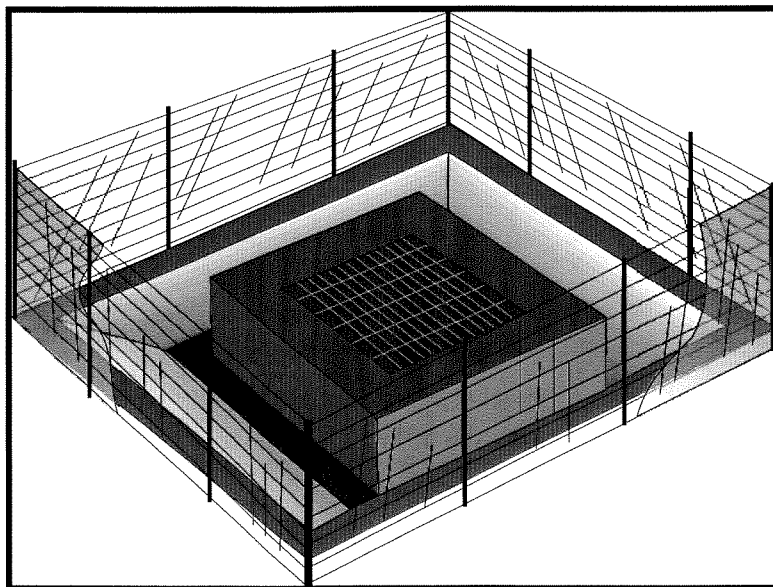


ENTRENCHMENT DETAIL
N.T.S.



OPTIONAL ENTRENCHMENT DETAIL

N.T.S.



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Devices used at storm drain inlets that are subject to runoff from construction activities to detain and/or to filter sediment-laden runoff to allow sediment to settle and/or to filter sediment prior to discharge into storm drainage systems or watercourses.

Appropriate Applications

- Where ponding will not encroach into highway traffic.
- Where sediment laden surface runoff may enter an inlet.
- Where disturbed drainage areas have not yet been permanently stabilized.
- Where the drainage area is 0.4 ha (1 ac) or less.
- Appropriate during wet and snow-melt seasons.

Limitations

- Requires an adequate area for water to pond without encroaching upon traveled way and should not present itself to be an obstacle to oncoming traffic.
- May require other methods of temporary protection to prevent sediment-laden storm water and non-storm water discharges from entering the storm drain system.
- Sediment removal may be difficult in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use other on-site sediment trapping techniques (e.g. check dams) in conjunction with inlet protection.
- Frequent maintenance is required.
- For drainage areas larger than 0.4 ha (1 ac), runoff shall be routed to a sediment trapping device designed for larger flows. See BMPs SC-2, "Sediment/Desilting Basin," and SC-3 "Sediment Trap."

- Filter fabric fence inlet protection is appropriate in open areas that are subject to sheet flow and for flows not exceeding 0.014 m³/s (0.5 cfs).
- Gravel bag barriers for inlet protection are applicable when sheet flows or concentrated flows exceed 0.014 m³/s (0.5 cfs), and it is necessary to allow for overtopping to prevent flooding.
- Fiber rolls and foam barriers are not appropriate for locations where they cannot be properly anchored to the surface.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected and overflow capability is needed.

Standards and Specifications

Identify existing and/or planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed, and which method to use.

Methods and Installation

- **DI Protection Type 1 - Filter Fabric Fence** - The filter fabric fence (Type 1) protection is illustrated on Page 5. Similar to constructing a silt fence. See BMP SC-1, "Silt Fence." Do not place filter fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced.
- **DI Protection Type 2 - Excavated Drop Inlet Sediment Trap** - The excavated drop inlet sediment trap (Type 2) is illustrated in Page 6. Similar to constructing a temporary silt fence, See BMP SC-1, "Silt Fence." Size excavated trap to provide a minimum storage capacity calculated at the rate of 130 m³/ha (67 yd³/ac) of drainage area.
- **DI Protection Type 3 – Gravel bag** - The gravel bag barrier (Type 3) is illustrated in Page 7. Flow from a severe storm shall not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with BMP SC-6, "Gravel Bag Berm." Gravel bags shall be used due to their high permeability.
- **DI Protection Type 4 – Foam Barriers and Fiber Rolls** – Foam barrier or fiber roll (Type 4) is placed around the inlet and keyed and anchored to the surface. Foam barriers and fiber rolls are intended for use as inlet protection where the area around the inlet is unpaved and the foam barrier or fiber roll can be secured to the surface. RE or Construction Storm Water Coordinator approval is required.

Maintenance and Inspection

General

- Inspect all inlet protection devices before and after every rainfall event, and weekly during the rest of the rainy season. During extended rainfall events, inspect inlet protection devices at least once every 24 hours.

- Inspect the storm drain inlet after severe storms in the rainy season to check for bypassed material.
- Remove all inlet protection devices within thirty days after the site is stabilized, or when the inlet protection is no longer needed.
 - Bring the disturbed area to final grade and smooth and compact it. Appropriately stabilize all bare areas around the inlet.
 - Clean and re-grade area around the inlet and clean the inside of the storm drain inlet as it must be free of sediment and debris at the time of final inspection.

Requirements by Method

■ ***Type 1 - Filter Fabric Fence***

- This method shall be used for drain inlets requiring protection in areas where finished grade is established and erosion control seeding has been applied or is pending.
- Make sure the stakes are securely driven in the ground and are structurally sound (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes.
- Replace or clean the fabric when the fabric becomes clogged with sediment. Make sure the fabric does not have any holes or tears. Repair or replace fabric as needed or as directed by the RE.
- At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications Section 7-1.13.

■ ***Type 2 – Excavated Drop Inlet Sediment Trap***

- This method may be used for drain inlets requiring protection in areas that have been cleared and grubbed, and where exposed soil areas are subject to grading.
- Remove sediment from basin when the volume of the basin has been reduced by one-half.

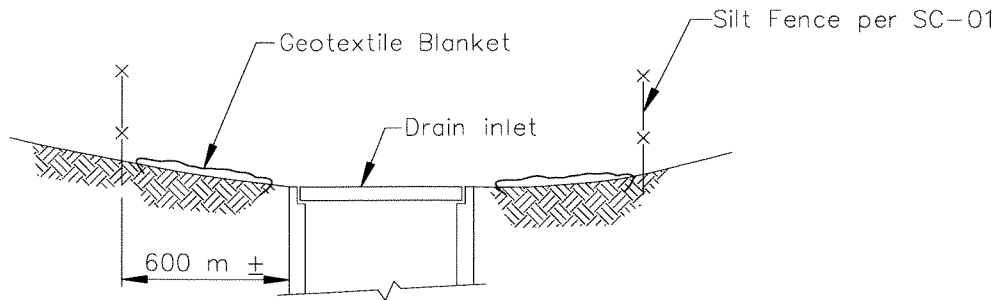
■ ***Type 3 - Gravel Bag Barrier***

- This method may be used for drain inlets surrounded by AC or paved surfaces.
- Inspect bags for holes, gashes, and snags.

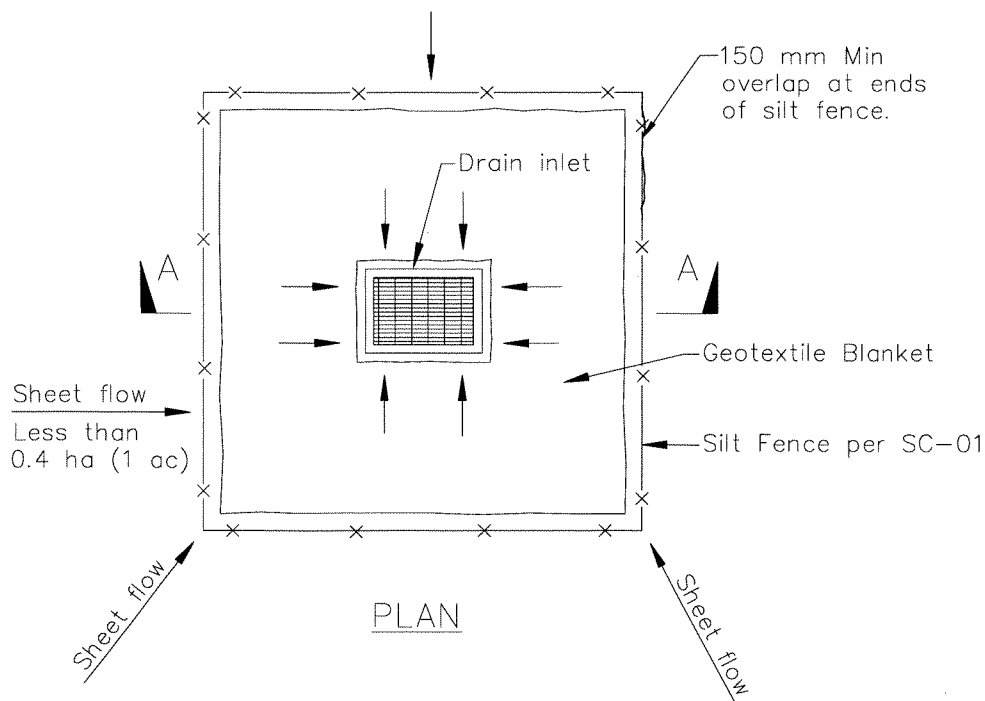
- Check gravel bags for proper arrangement and displacement. Remove the sediment behind the barrier when it reaches one-third the height of the barrier. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications Section 7-1.13.

■ ***Type 4 Foam Barriers and Fiber Rolls***

- This method may be used for drain inlets requiring protection in areas that have been cleared and grubbed, and where exposed soil areas subject to grading. RE or Construction Storm Coordinator approval is required.
- Check foam barrier or fiber roll for proper arrangement and displacement. Remove the sediment behind the barrier when it reaches one-third the height of the barrier. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications.



SECTION A-A

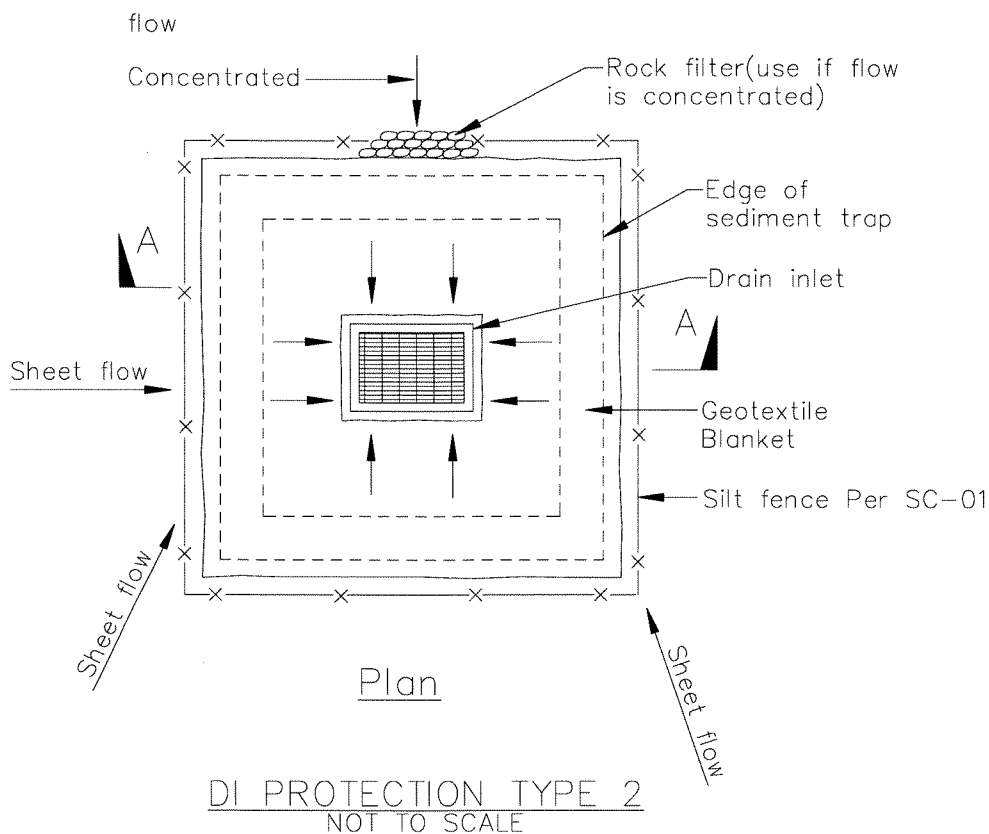
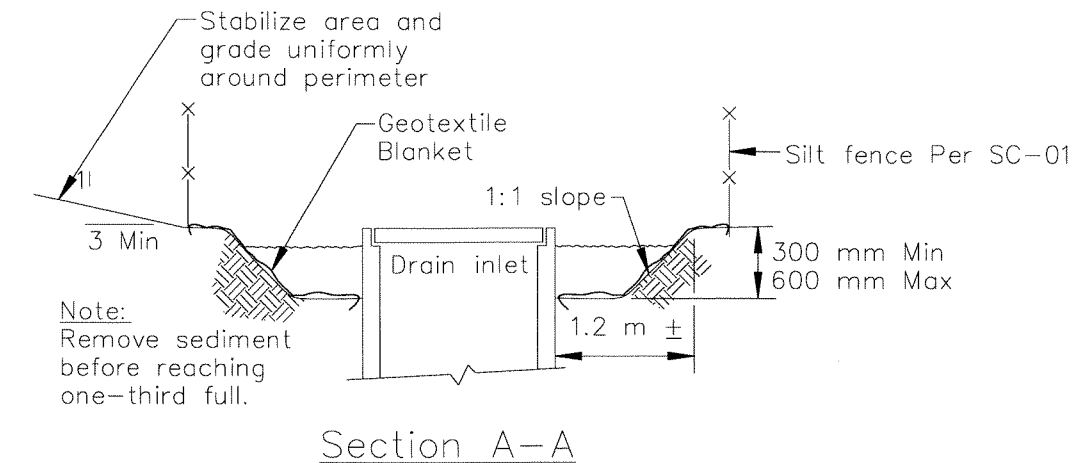


PLAN

DI PROTECTION TYPE 1
NOT TO SCALE

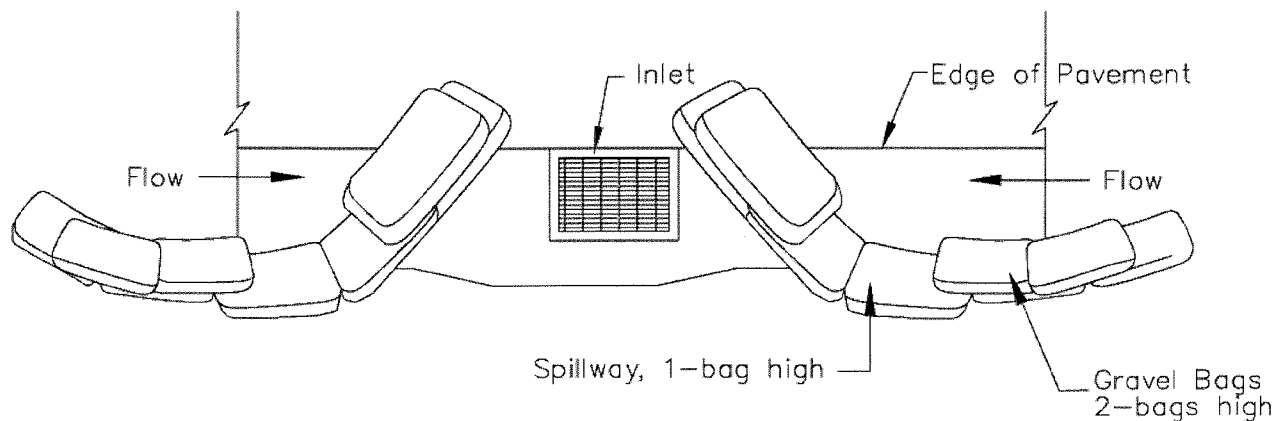
NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.

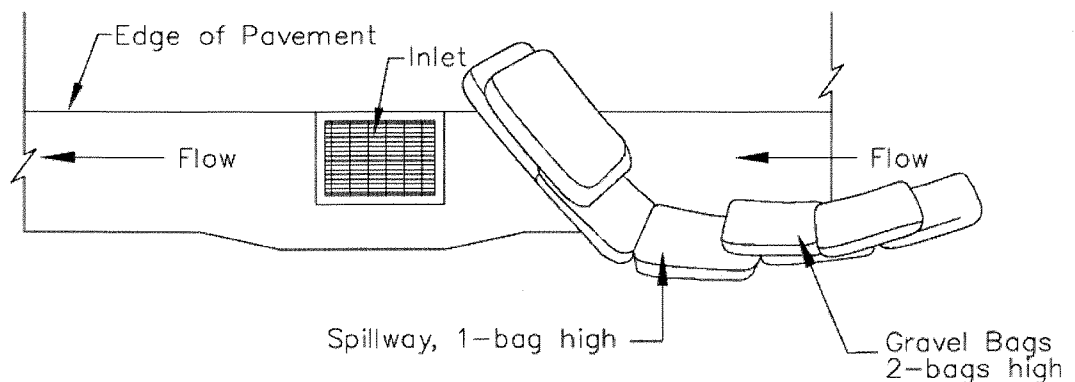


Notes

1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.



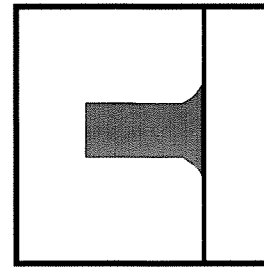
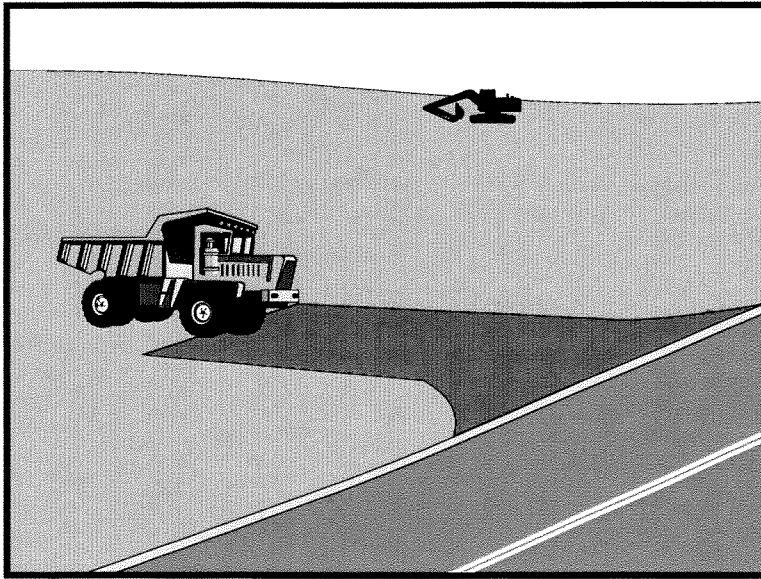
TYPICAL PROTECTION FOR INLET WITH OPPOSING FLOW DIRECTIONS



TYPICAL PROTECTION FOR INLET WITH SINGLE FLOW DIRECTION

NOTES:

1. Intended for short-term use.
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed.
5. Not applicable in areas with high silts and clays without filter fabric.



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Appropriate Applications

- Use at construction sites:
 - Where dirt or mud can be tracked onto public roads.
 - Adjacent to water bodies.
 - Where poor soils are encountered.
 - Where dust is a problem during dry weather conditions.
- This BMP may be implemented on a project-by-project basis in addition to other BMPs when determined necessary and feasible by the Resident Engineer (RE).

Limitations

- Site conditions will dictate design and need.

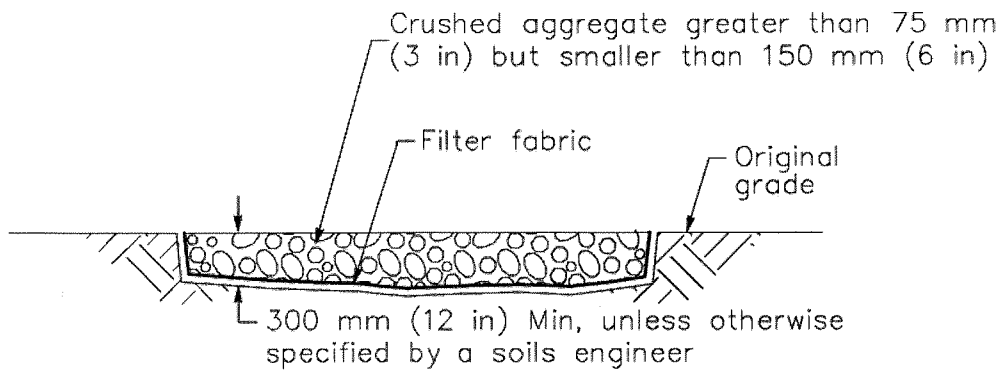
Standards and Specifications

- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment-trapping device before discharge.
- Design stabilized entrance/exit to support the heaviest vehicles and equipment that will use it.

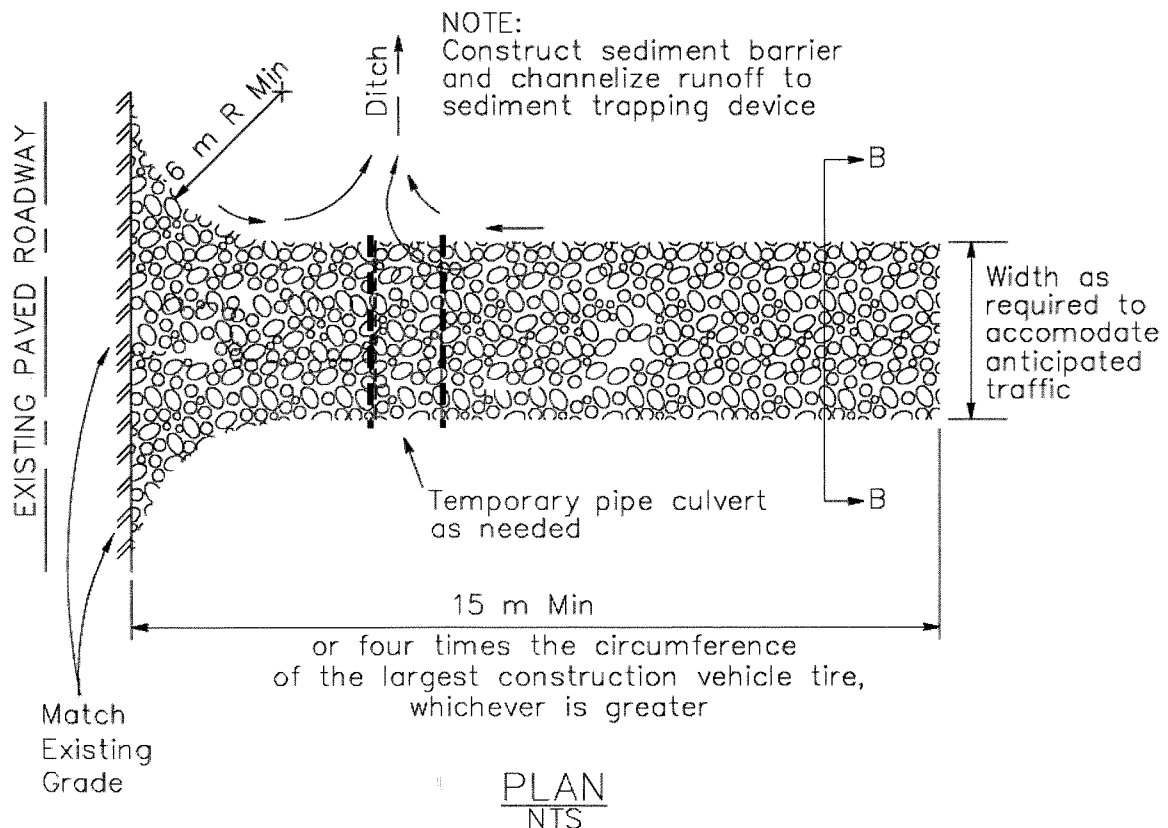
- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. The use of asphalt concrete (AC) grindings for stabilized construction access/roadway is not allowed.
- Use of constructed/manufactured steel plates with ribs for entrance/exit access is allowed with written approval from the RE.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 300 mm (12 in) depth, or place aggregate to a depth recommended by the RE. Crushed aggregate greater than 75 mm (3 inches) and smaller than 150 mm (6 inches) shall be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Implement BMP SC-7, "Street Sweeping and Vacuuming" as needed and as required.
- Require all employees, subcontractors, and suppliers to utilize the stabilized construction access.
- All exit locations intended to be used continuously and for a period of time shall have stabilized construction entrance/exit BMPs (TC-1 "Stabilized Construction Entrance/Exit" or TC-3 "Entrance/Outlet Tire Wash").

Maintenance and Inspection

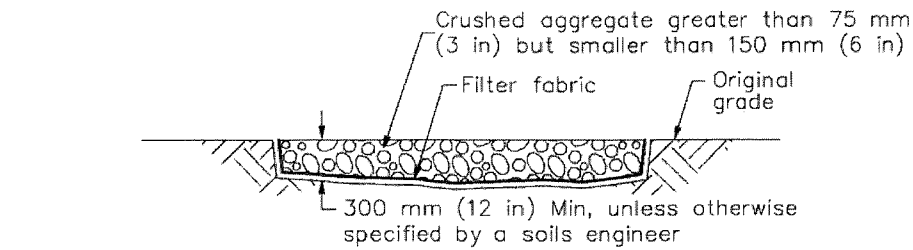
- Inspect routinely for damage and assess effectiveness of the BMP. Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment or as directed by the RE.
- Keep all temporary roadway ditches clear.
- Inspect for damage and repair as needed.



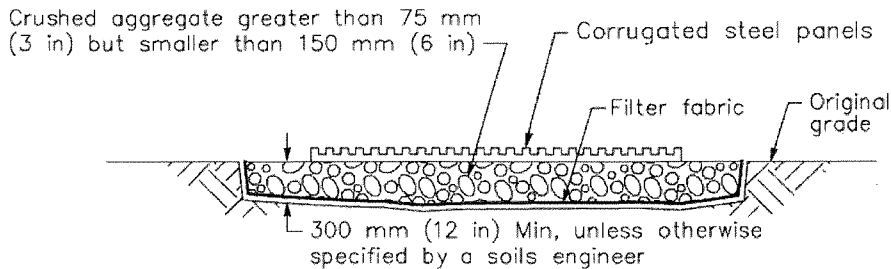
SECTION B-B
NTS



Stabilized Construction Entrance/Exit (Type 1)

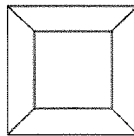


SECTION B-B
NTS

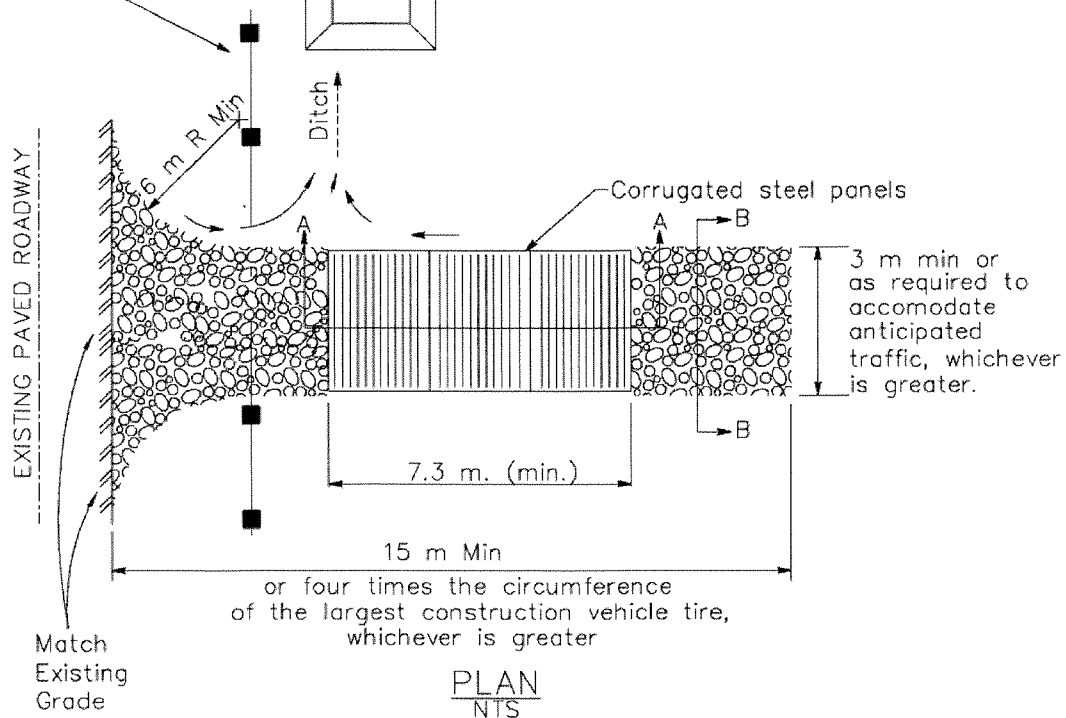


SECTION A-A
NOT TO SCALE

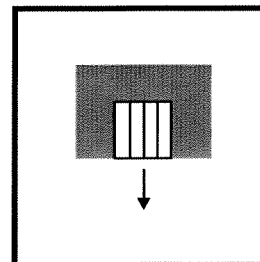
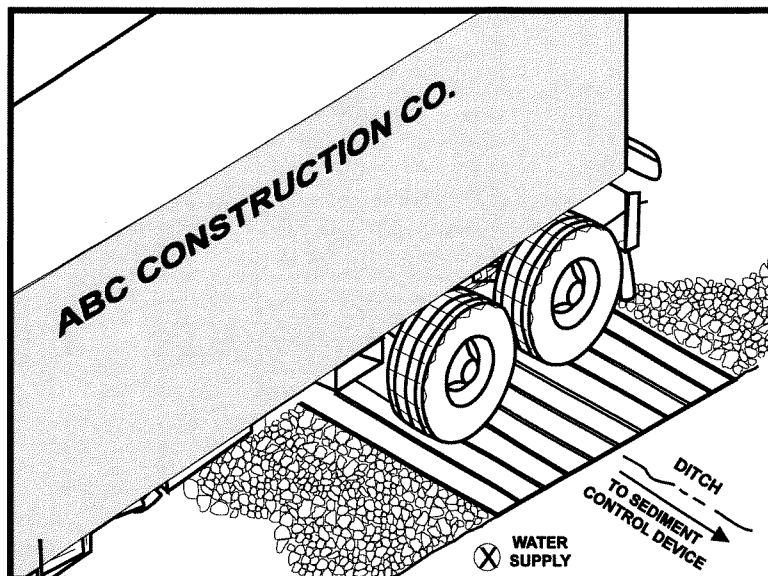
NOTE:
Construct sediment barrier and channelize runoff to sediment trapping device



Sediment trapping device



Stabilized Construction Entrance/Exit (Type 2)



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose A tire wash is an area located at stabilized construction access points to remove sediment from tires and undercarriages, and to prevent sediment from being transported onto public roadways.

Appropriate Applications

- Tire washes may be used on construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Resident Engineer (RE).

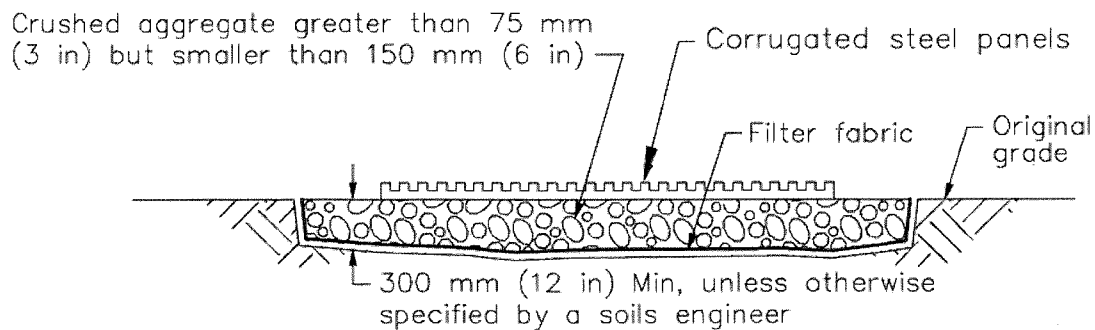
Limitations

- Requires a supply of wash water.
- Requires a turnout or doublewide exit to avoid having entering vehicles drive through the wash area.

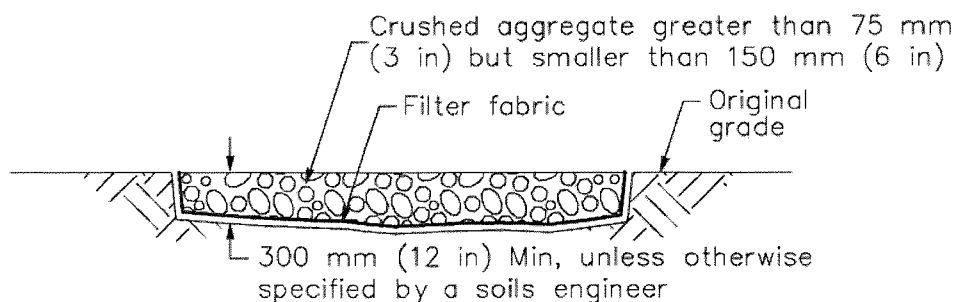
Standards and Specifications

- Incorporate with a stabilized construction entrance/exit. See BMP TC-1, "Stabilized Construction Entrance/Exit."
- Construct on level ground when possible, on a pad of coarse aggregate, greater than 75 mm (3 inches) and smaller than 150 mm (6 inches). A geotextile fabric shall be placed below the aggregate.
- Wash rack shall be designed and constructed/manufactured for anticipated traffic loads.
- Provide a drainage ditch that will convey the runoff from the wash area to a sediment trapping device. The drainage ditch shall be of sufficient grade, width, and depth to carry the wash runoff.

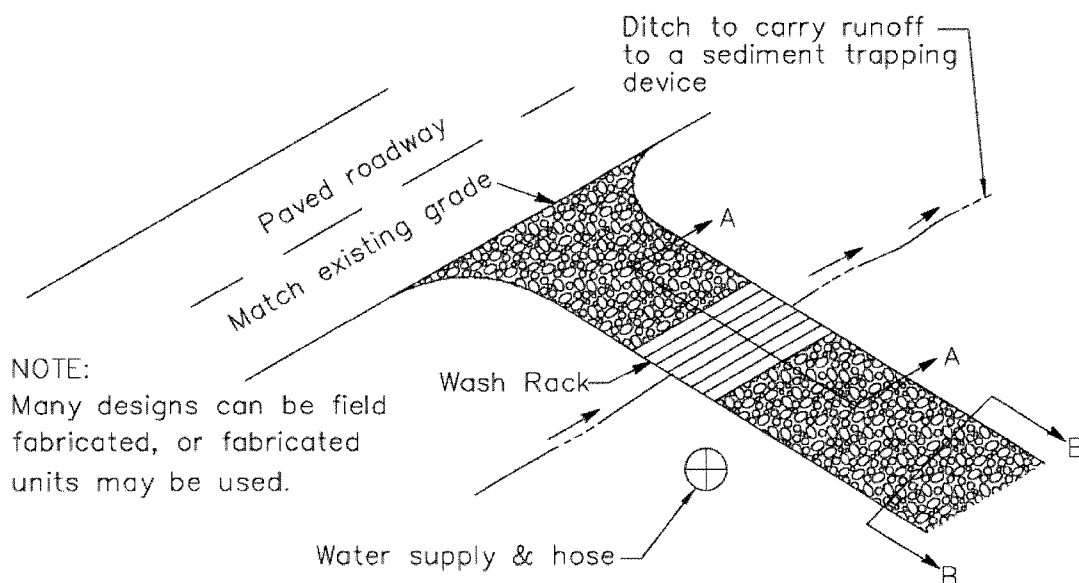
- Require all employees, subcontractors, and others that leave the site with mud-caked tires and/or undercarriages to use the wash facility.
 - Implement BMP SC-7, “Street Sweeping and Vacuuming” as needed.
 - Use of constructed or prefabricated steel plate with ribs for entrance/exit access is allowed with written approval of RE.
- Maintenance and Inspection
- Remove accumulated sediment in wash rack and/or sediment trap to maintain system performance.
 - Inspect routinely for damage and repair as needed.



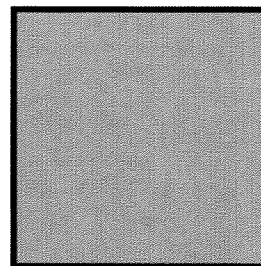
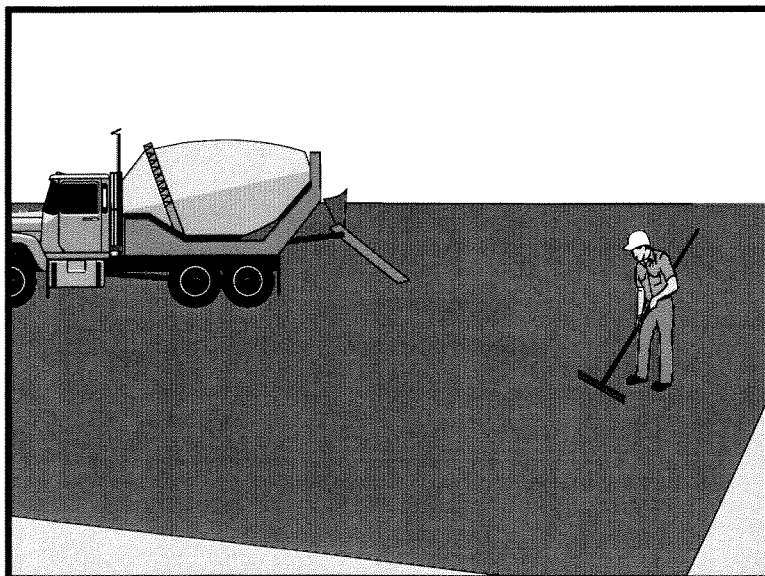
SECTION A-A
NOT TO SCALE



SECTION B-B
NTS



TYPICAL TIRE WASH
NOT TO SCALE



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Procedures and practices for conducting paving, saw cutting, and grinding operations to minimize the transport of pollutants to the storm drain system or receiving water body.

Appropriate Applications

These procedures are implemented where paving, surfacing, resurfacing, grinding or sawcutting, may pollute storm water runoff or discharge to the storm drain system or watercourses.

Limitations

- Finer solids are not effectively removed by filtration systems.
- Paving opportunities may be limited during wet weather.

Standards and Specifications

- Substances used to coat asphalt transport trucks, asphalt trucks, and asphalt spreading equipment shall not contain soap and shall be non-foaming and non-toxic.
- Place plastic materials under asphaltic concrete (AC) paving equipment while not in use, to catch and/or contain drips and leaks. See also BMP WM-4, "Spill Prevention and Control."
- When paving involves AC, the following steps shall be implemented to prevent the discharge of uncompacted or loose AC, tack coats, equipment cleaners, or other paving materials:
 - Minimize sand and gravel from new asphalt from getting into storm drains, streets, and creeks by sweeping.
 - Old or spilled asphalt must be recycled or disposed as approved by the Resident Engineer (RE).

- AC grindings, pieces, or chunks used in embankments or shoulder backing must not be allowed to enter any storm drain or watercourses. Install silt fence until structure is stabilized or permanent controls are in place.
- Collect and remove all broken asphalt and recycle when practical; otherwise, dispose in accordance with Standard Specification 7-1.13.
- Any AC chunks and pieces used in embankments must be placed above the water table and covered by at least 0.3 m (1 ft) of material.
- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate must not be allowed to enter any storm drain or water courses. Use silt fence until installation is complete.
- Use only non-toxic substances to coat asphalt transport trucks and asphalt spreading equipment.
- Drainage inlet structures and manholes shall be covered with filter fabric during application of seal coat, tack coat, slurry seal, and/or fog seal.
- Seal coat, tack coat, slurry seal, or fog seal shall not be applied if rainfall is predicted to occur during the application or curing period.
- Paving equipment parked onsite shall be parked over plastic to prevent soil contamination.
- Clean asphalt-coated equipment off-site whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in BMP WM-5, “Solid Waste Management.” Any cleaning onsite shall follow BMP NS-8, “Vehicle and Equipment Cleaning.”
- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect and return to aggregate base stockpile, or dispose of properly.
- Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in BMP WM-8, “Concrete Waste Management,” or dispose in accordance with Standard Specifications Section 7-1.13.
- Do not allow saw-cut Portland Concrete Cement (PCC) slurry to enter storm drains or watercourses.

Pavement Grinding or Removal

- Residue from PCC grinding operations shall be picked up by means of a vacuum attachment to the grinding machine, shall not be allowed to flow across the pavement, and shall not be left on the surface of the pavement. See also BMP WM-8, “Concrete Waste Management,” and BMP WM-10, “Liquid Waste Management,” and Standard Specifications Section 42-2

“Grindings.”

- Collect pavement digout material by mechanical or manual methods. This material may be recycled if approved by the RE for use as shoulder backing or base material at locations approved by the RE.
- If digout material cannot be recycled, transport the material back to a maintenance facility or approved storage site.
- Digout activities shall not be conducted in the rain.
- When approved by the RE, stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses and stored consistent with BMP WM-3, “Stockpile Management.”
- Disposal or use of AC grindings shall be approved by the RE. See also BMP WM-8, “Concrete Waste Management.”

Thermoplastic Striping

- All thermoplastic striper and pre-heater equipment shutoff valves shall be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the storm water drainage system, or watercourses.
- The pre-heater shall be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move when the vehicle is deadheaded.
- Contractor shall not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible recycle thermoplastic material. Thermoplastic waste shall be disposed of in accordance with Standard Specification 7-1.13.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the storm water drainage system or watercourses.
- Melting tanks shall be loaded with care and not filled to beyond six inches from the top to leave room for splashing when vehicle is deadheaded.
- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.
- On large scale projects, use mechanical or manual methods to collect excess

bituminous material from the roadway after removal of markers.

- Waste shall be disposed of in accordance with Standard Specification 7-1.13.

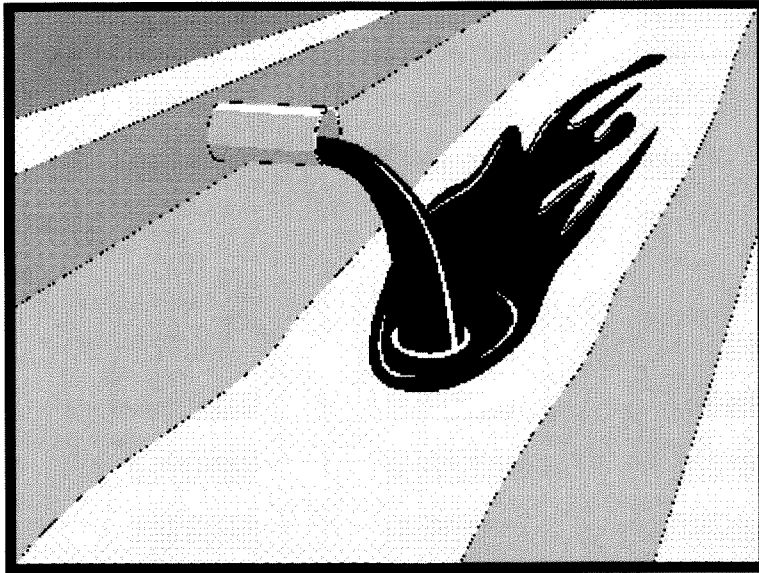
Maintenance and Inspection

- Inspect and maintain machinery regularly to minimize leaks and drips.
- Ensure that employees and subcontractors are implementing appropriate measures during paving operations.



Illicit Connection/Illegal Discharge Detection and Reporting

NS-6



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

- Definition and Purpose** Procedures and practices designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site and report incidents to the Resident Engineer (RE).
- Appropriate Applications**
- Illicit connection/illegal discharge detection and reporting is applicable anytime an illicit connection or discharge is discovered or illegally dumped material is found on the construction site.
 - This best management practice (BMP) applies to all construction projects.
- Limitations**
- Unlabeled or non-identifiable material shall be assumed to be hazardous.
 - Illicit connections and illegal discharges or dumping, for the purposes of this BMP, refer to discharges and dumping caused by parties other than the contractor.
 - Procedures and practices presented in this BMP are general. Contractor shall use extreme caution, immediately notify the RE when illicit connections or illegal dumping or discharges are discovered, and take no further action unless directed by the RE.
 - If pre-existing hazardous materials or wastes are known to exist onsite, the contractor's responsibility will be detailed in separate special provisions.

Illicit Connection/Illegal Discharge Detection and Reporting

NS-6

Standards and Specifications *Planning*

- Inspect site before beginning the job for evidence of illicit connections or illegal dumping or discharges.
- Inspect site regularly during project execution for evidence of illicit connections or illegal dumping or discharges.
- Observe site perimeter for evidence or potential of illicitly discharged or illegally dumped material, which may enter the job site.

Identification of illicit connections and illegal dumping or discharges.

- Solids - Look for debris, or rubbish piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.
- Liquids – signs of illegal liquid dumping or discharge can include:
 - Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils.
 - Pungent odors coming from the drainage systems.
 - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes.
 - Abnormal water flow during the dry weather season.
- Urban Areas - Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:
 - Abnormal water flow during the dry weather season.
 - Unusual flows in subdrain systems used for dewatering.
 - Pungent odors coming from the drainage systems.
 - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes.
 - Excessive sediment deposits, particularly adjacent to or near active off-site construction projects.



Illicit Connection/Illegal Discharge Detection and Reporting

NS-6

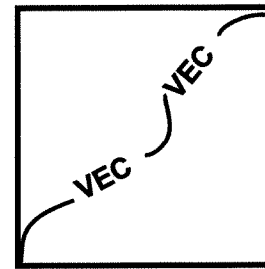
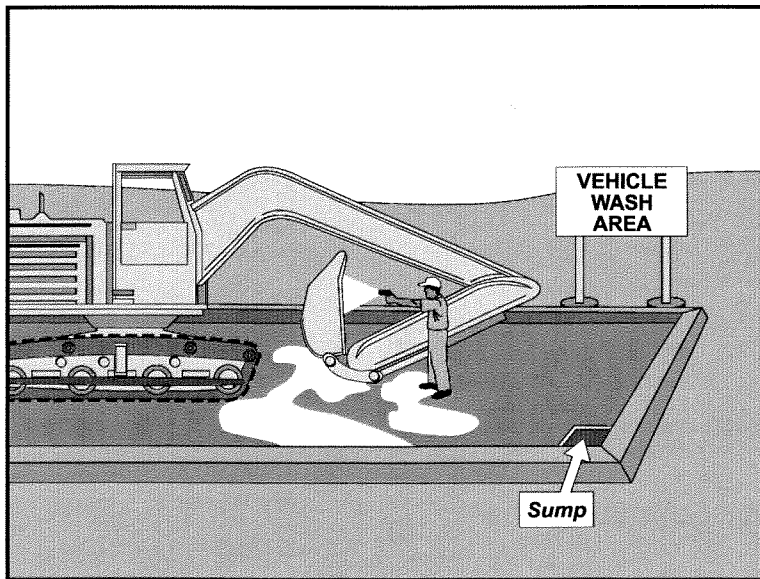
- Rural Areas - Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:
 - Abnormal water flow during the dry weather season.
 - Non-standard junction structures.
 - Broken concrete or other disturbances at or near junction structures.

Reporting

- Notify the RE of any illicit connections and illegal dumping or discharge incidents at the time of discovery. The RE will notify the District Construction Storm Water Coordinator and the Construction Hazmat Coordinator for reporting.

Cleanup and Removal The contractor is not responsible for investigation and clean up of illicit or illegal dumping or discharges not generated by the contractor. Caltrans may direct contractor to clean up non-hazardous dumped or discharged material on the construction site.





Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose Vehicle and equipment cleaning procedures and practices are used to minimize or eliminate the discharge of pollutants from vehicle and equipment cleaning operations to storm drain system or to watercourses.

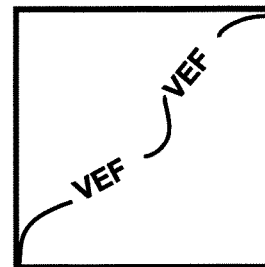
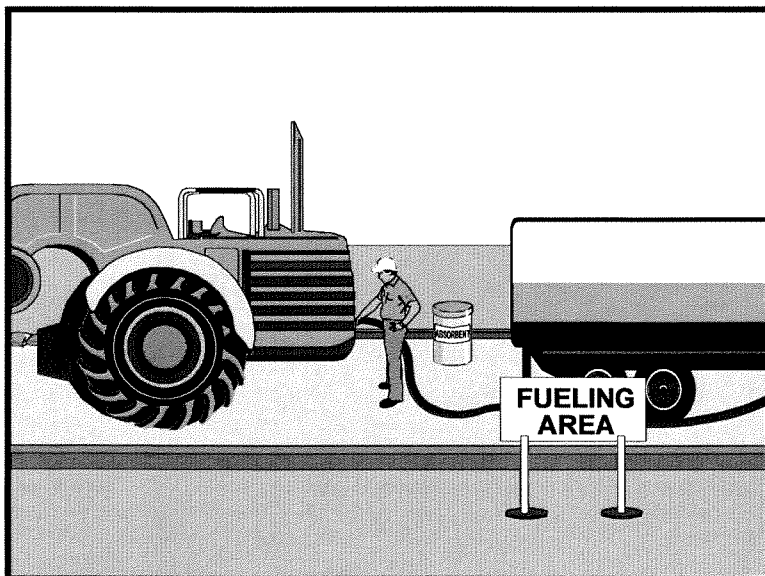
Appropriate Applications These procedures are applied on all construction sites where vehicle and equipment cleaning is performed.

Limitations ■ None.

- Standards and Specifications**
- On-site vehicle and equipment washing is discouraged.
 - Cleaning of vehicles and equipment with soap, solvents or steam shall not occur on the project site unless the Resident Engineer (RE) has been notified in advance and the resulting wastes are fully contained and disposed of outside the highway right-of-way in conformance with the provisions in the Standard Specifications Section 7-1.13. Resulting wastes and by-products shall not be discharged or buried within the highway right-of-way, and must be captured and recycled or disposed according to the requirements of WM-10, "Liquid Waste Management" or WM-6, "Hazardous Waste Management," depending on the waste characteristics. Minimize use of solvents. The use of diesel for vehicle and equipment cleaning is prohibited.
 - Vehicle and equipment wash water shall be contained for percolation or evaporative drying away from storm drain inlets or watercourses and shall not be discharged within the highway right-of-way. Apply sediment control BMPs if applicable.
 - All vehicles/equipment that regularly enter and leave the construction site must be cleaned off-site.
 - When vehicle/equipment washing/cleaning must occur onsite, and the

operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area shall have the following characteristics, and shall be arranged with the construction storm water coordinator:

- Located away from storm drain inlets, drainage facilities, or watercourses.
 - Paved with concrete or asphalt and bermed to contain wash waters and to prevent run-on and runoff.
 - Configured with a sump to allow collection and disposal of wash water.
 - Wash waters shall not be discharged to storm drains or watercourses.
 - Used only when necessary.
- When cleaning vehicles/equipment with water:
- Use as little water as possible. High pressure sprayers may use less water than a hose, and shall be considered.
 - Use positive shutoff valve to minimize water usage.
 - Facility wash racks shall discharge to a sanitary sewer, recycle system or other approved discharge system and shall not discharge to the storm drainage system or watercourses.
- Maintenance and Inspection
- The control measure shall be inspected at a minimum of once a week.
 - Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
 - Inspect sump regularly and remove liquids and sediment as needed or as directed by the RE.



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose Vehicle and equipment fueling procedures and practices are designed to minimize or eliminate the discharge of fuel spills and leaks into storm drain systems or to watercourses.

Appropriate Applications These procedures are applied on all construction sites where vehicle and equipment fueling takes place.

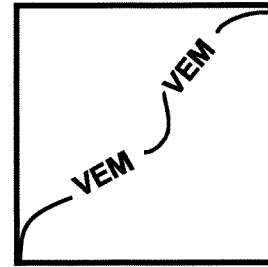
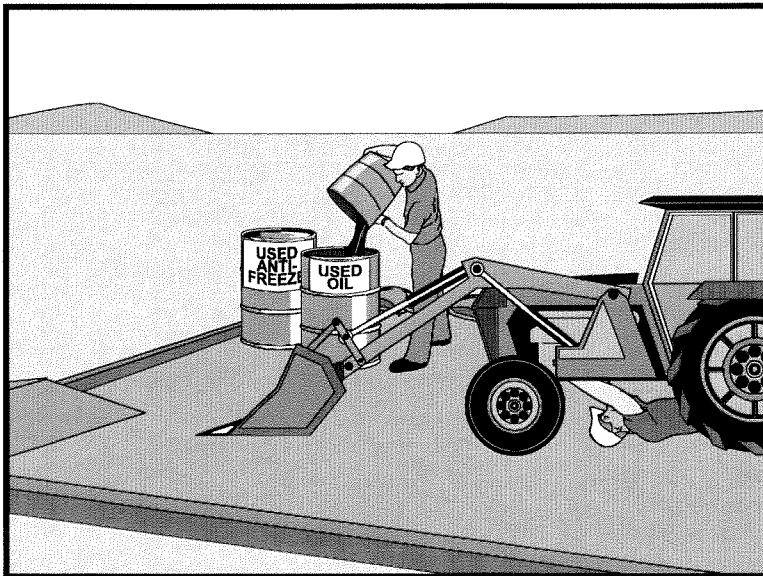
Limitations ■ Onsite vehicle and equipment fueling shall only be used where it's impractical to send vehicles and equipment off-site for fueling.

- Standards and Specifications**
- When fueling must occur onsite, the contractor shall select and designate an area to be used, subject to approval of the Resident Engineer (RE).
 - Absorbent spill clean-up materials and spill kits shall be available in fueling areas and on fueling trucks and shall be disposed of properly after use.
 - Drip pans or absorbent pads shall be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
 - Dedicated fueling areas shall be protected from storm water run-on and runoff, and shall be located at least 15 m (50 ft) from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
 - Nozzles used in vehicle and equipment fueling shall be equipped with an automatic shut-off to control drips. Fueling operations shall not be left unattended.
 - Protect fueling areas with berms and/or dikes to prevent run-on, runoff, and to contain spills.

- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD). Ensure the nozzle is secured upright when not in use.
- Fuel tanks shall not be "topped-off."
- Vehicles and equipment shall be inspected on each day of use for leaks. Leaks shall be repaired immediately or problem vehicles or equipment shall be removed from the project site.
- Absorbent spill clean-up materials shall be available in fueling and maintenance areas and used on small spills instead of hosing down or burying techniques. The spent absorbent material shall be removed promptly and disposed of properly.
- Federal, state, and local requirements shall be observed for any stationary above ground storage tanks. Refer to WM-1, "Material Delivery and Storage."
- Mobile fueling of construction equipment throughout the site shall be minimized. Whenever practical, equipment shall be transported to the designated fueling area.

Maintenance and Inspection

- Fueling areas and storage tanks shall be inspected regularly.
- Keep an ample supply of spill cleanup material on the site.
- Immediately cleanup spills and properly dispose of contaminated soil and cleanup materials.



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose Procedures and practices to minimize or eliminate the discharge of pollutants to the storm drain systems or to watercourses from vehicle and equipment maintenance procedures.

Appropriate Applications These procedures are applied on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

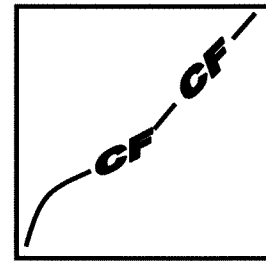
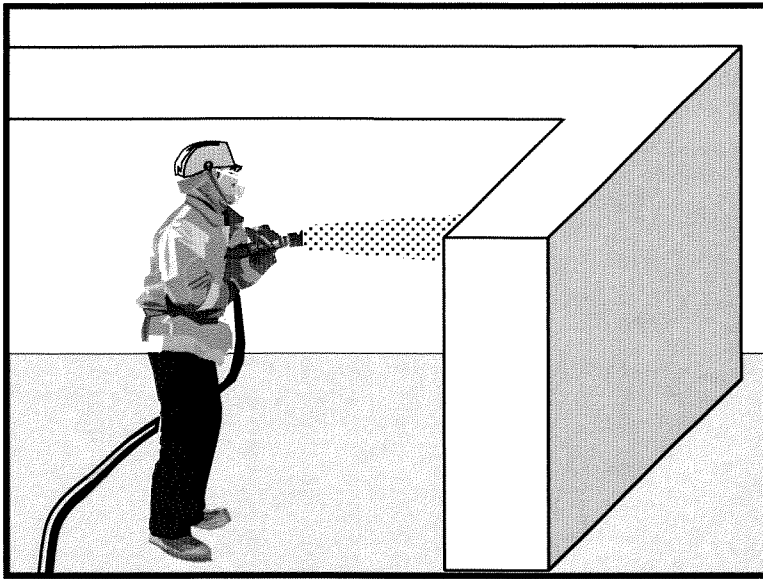
Limitations ■ None identified.

- Standards and Specifications**
- Drip pans or absorbent pads shall be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
 - All maintenance areas are required to have spill kits and/or use other spill protection devices.
 - Dedicated maintenance areas shall be protected from storm water run-on and runoff, and shall be located at least 15 m (50 ft) from downstream drainage facilities and watercourses.
 - Drip Pans or plastic sheeting shall be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.
 - Absorbent spill clean-up materials shall be available in maintenance areas and shall be disposed of properly after use. Substances used to coat asphalt transport trucks and asphalt-spreading equipment shall be non-toxic.
 - Use off-site maintenance facilities whenever practical.

- For long-term projects, consider constructing roofs or using portable tents over maintenance areas.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not dump fuels and lubricants onto the ground.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose or recycle used batteries.
- Do not bury used tires.
- Repair of fluid and oil leaks immediately.
- Provide spill containment dikes or secondary containment around stored oil and chemical drums.

Maintenance and Inspection

- Maintain waste fluid containers in leak proof condition.
- Vehicle and equipment maintenance areas shall be inspected regularly.
- Vehicles and equipment shall be inspected on each day of use. Leaks shall be repaired immediately or the problem vehicle(s) or equipment shall be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose Concrete finishing methods are used for bridge deck rehabilitation, paint removal, curing compound removal, and final surface finish appearances. Methods include sand blasting, shot blasting, grinding, or high pressure water blasting. Proper procedures minimize the impact that concrete finishing methods may have on runoff.

Appropriate Applications These procedures apply to all construction locations where concrete finishing operations are performed.

Limitations ■ Specific permit requirements may be included in the contract documents for certain concrete finishing operations.

Standards and Specifications ■ Follow containment requirements stated in the project special provisions, if any.

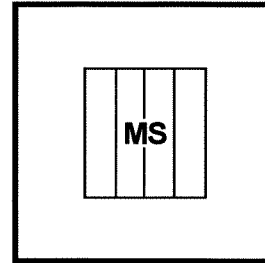
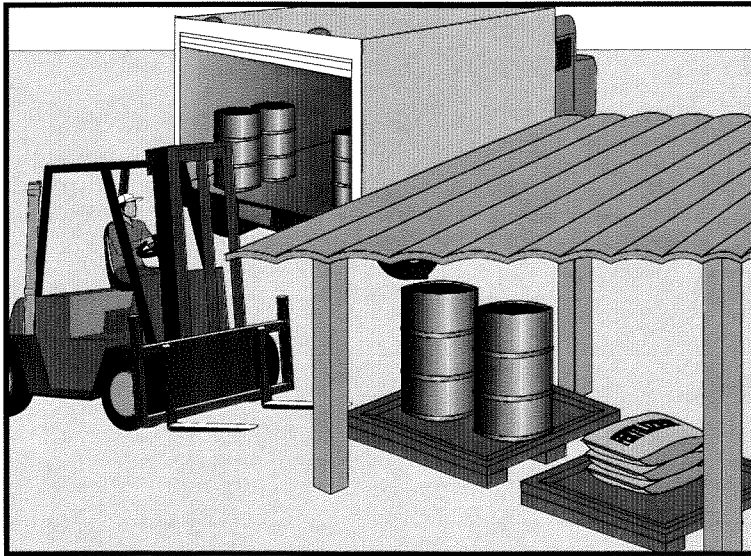
■ Collect and properly dispose of water and solid waste from high-pressure water blasting operations.

■ Collect water from blasting operations and transport or dispose of water in a non-erodible manner. Refer to BMPs SS-9, "Earth Dikes/Drainage Swales & Lined Ditches," SS-10, "Outlet Protection/Velocity Dissipation Devices," and SS-11, "Slope Drains."

■ Direct water from blasting operations away from inlets and watercourses to collection areas for removal (e.g., dewatering) as approved in advance by the RE and in accordance with applicable permits.

■ Protect inlets during sandblasting operations. Refer to BMP SC-10, "Storm Drain Inlet Protection."

- Refer to BMP WM-8, "Concrete Waste Management."
 - Minimize the drift of dust and blast material as much as possible by keeping the blasting nozzle close to the surface.
 - When blast residue contains a potentially hazardous waste, refer to BMP WM-6, "Hazardous Waste Management."
- Maintenance and Inspection
- Follow inspection procedure as required in the project special provisions.
 - At a minimum, inspect containment structures, if any, for damage or voids prior to use each day and prior to the onset of rain.
 - At the end of each work shift, remove and contain the liquid and solid wastes from containment structures, if any, and from the general work area.
 - Discharges to waterways shall be reported to RE immediately upon discovery. A written discharge notification must follow within 7 days or as required by special provisions.



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose Procedures and practices for the proper handling and storage of materials in a manner that minimizes or eliminates the discharge of these materials to the storm drain system or to watercourses.

Appropriate Applications These procedures are implemented at all construction sites with delivery and storage of the following:

- Hazardous chemicals such as:
 - Acids,
 - lime,
 - glues,
 - adhesives,
 - paints,
 - solvents, and
 - curing compounds.
- Soil stabilizers and binders.
- Fertilizers.
- Detergents.
- Plaster.
- Petroleum products such as fuel, oil, and grease.
- Asphalt and concrete components.
- Pesticides and herbicides.

- Other materials that may be detrimental if released to the environment.

Limitations ■ Space limitation may preclude indoor storage.

- Storage sheds must meet building & fire code requirements.

Standards and Specifications

General

- Train employees and subcontractors on the proper material delivery and storage practices.
- Temporary storage area shall be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) shall be supplied to the Resident Engineer (RE) for all materials stored.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 shall be stored in approved containers and drums and shall be placed in temporary containment facilities for storage.
- Throughout the rainy season, each temporary containment facility shall have a permanent cover and side wind protection or be covered during non-working days and prior to and during rain events.
- A temporary containment facility shall provide for a spill containment volume able to contain precipitation from a 24-hour, 25-year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility shall be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills shall be collected and placed into drums. These liquids shall be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids shall be sent to an approved disposal site.
- Sufficient separation shall be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, shall not be stored in the same temporary containment facility.
- Materials shall be stored in their original containers and the original product labels shall be maintained in place in a legible condition. Damaged or otherwise illegible labels shall be replaced immediately.

-
- Bagged and boxed materials shall be stored on pallets and shall not be allowed to accumulate on the ground. To provide protection from wind and rain, throughout the rainy season, bagged and boxed materials shall be covered during non-working days and prior to rain events.
- Stockpiles shall be protected in accordance with BMP WM-3, "Stockpile Management."
- Minimize the material inventory stored on-site (e.g., only a few days supply).
- Have proper storage instructions posted at all times in an open and conspicuous location.
- Do not store hazardous chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and when possible, under cover in secondary containment.
- Keep hazardous chemicals well labeled and in their original containers.
- Keep ample supply of appropriate spill clean up material near storage areas.
- Also see BMP WM-6, "Hazardous Waste Management", for storing of hazardous materials.

Material Delivery Practices

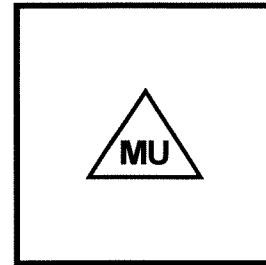
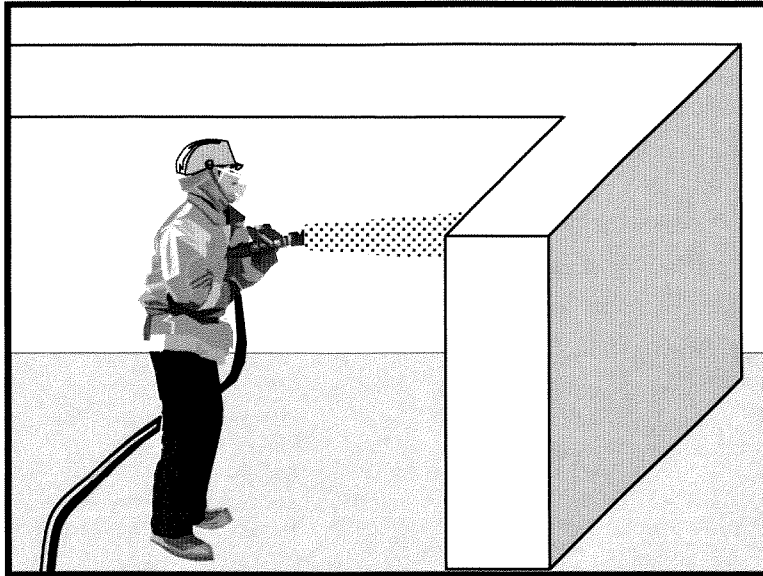
- Keep an accurate, up-to-date inventory of material delivered and stored on-site.
- Employees trained in emergency spill clean-up procedures shall be present when dangerous materials or liquid chemicals are unloaded.

Spill Clean-up

- Contain and clean up any spill immediately.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose any hazardous materials or contaminated soil.
- See BMP WM-4, "Spill Prevention and Control", for spills of chemicals and/or hazardous materials.

Maintenance and Inspection

- Storage areas shall be kept clean, well organized, and equipped with ample clean-up supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.
- Inspect storage areas before and after rainfall events, and at least weekly during other times. Collect and place into drums any spills or accumulated rainwater.



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose These are procedures and practices for use of construction material in a manner that minimizes or eliminates the discharge of these materials to the storm drain system or to watercourses.

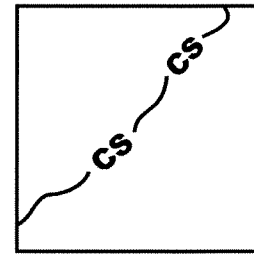
Appropriate Applications This BMP applies to all construction projects. These procedures apply when the following materials are used or prepared on site:

■ Hazardous chemicals such as:

Acids,
lime,
glues,
adhesives,
paints,
solvents, and
curing compounds.

- Soil stabilizers and binders.
- Fertilizers.
- Detergents.
- Plaster.
- Petroleum products such as fuel, oil, and grease.
- Asphalt and concrete components.
- Pesticides and herbicides.
- Other materials that may be detrimental if released to the environment.

- Limitations** ■ Safer alternative building and construction products may not be available or suitable in every instance.
- Standards and Specifications** ■ Material Safety Data Sheets (MSDS) shall be supplied to the Resident Engineer (RE) for all materials.
- Latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, may be disposed of with other construction debris.
 - Do not remove the original product label, it contains important safety and disposal information. Use the entire product before disposing of the container.
 - Mix paint indoors, or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain or watercourse. Dispose of any paint thinners, residue and sludge(s), that cannot be recycled, as hazardous waste.
 - For water-based paint, clean brushes to the extent practical, and rinse to a drain leading to a sanitary sewer where permitted, or into a concrete washout pit. For oil-based paints, clean brushes to the extent practical and filter and reuse thinners and solvents.
 - Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
 - Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials on-site when practical.
 - Do not over-apply fertilizers and pesticides. Prepare only the amount needed. Strictly follow the recommended usage instructions. Apply surface dressings in smaller applications, as opposed to large applications, to allow time for it to work in and to avoid excess materials being carried off-site by runoff.
 - Application of herbicides and pesticides shall be performed by a licensed applicator.
 - Contractors are required to complete the "Report of Chemical Spray Forms" when spraying herbicides and pesticides.
 - Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
 - Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.
- Maintenance and Inspections** ■ Spot check employees and subcontractors monthly throughout the job to ensure appropriate practices are being employed.



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose	Stockpile management procedures and practices are designed to reduce or eliminate air and storm water pollution from stockpiles of soil, and paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate subbase or pre-mixed aggregate, asphalt binder (so called “cold mix” asphalt) and pressure treated wood.
Appropriate Applications	Implemented in all projects that stockpile soil and other materials.
Limitations	<ul style="list-style-type: none"> ■ None identified
Standards and Specifications	<ul style="list-style-type: none"> ■ Protection of stockpiles is a year-round requirement. ■ Locate stockpiles a minimum of 15 m (50 ft) away from concentrated flows of storm water, drainage courses, and inlets. ■ Implement wind erosion control practices as appropriate on all stockpiled material. For specific information see BMP WE-1, “Wind Erosion Control.” ■ Stockpiles of contaminated soil shall be managed in accordance with BMP WM-7, “Contaminated Soil Management.” ■ Bagged materials should be placed on pallets and under cover.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials shall be protected further as follows:

■ ***Soil stockpiles:***

- During the rainy seasons, soil stockpiles shall be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- During the non-rainy season, soil stockpiles shall be covered and protected with a temporary perimeter sediment barrier prior to the onset of precipitation.

■ ***Stockpiles of portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate subbase:***

- During the rainy season, the stockpiles shall be covered or protected with a temporary perimeter sediment barrier at all times.
- During the non-rainy season, the stockpiles shall be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.

■ ***Stockpiles of “cold mix”:***

- During the rainy season, cold mix stockpiles shall be placed on and covered with plastic or comparable material at all times.
- During the non-rainy season, cold mix stockpiles shall be placed on and covered with plastic or comparable material prior to the onset of precipitation.

■ ***Stockpiles/Storage of pressure treated wood with copper, chromium, and arsenic or ammonical, copper, zinc, and arsenate:***

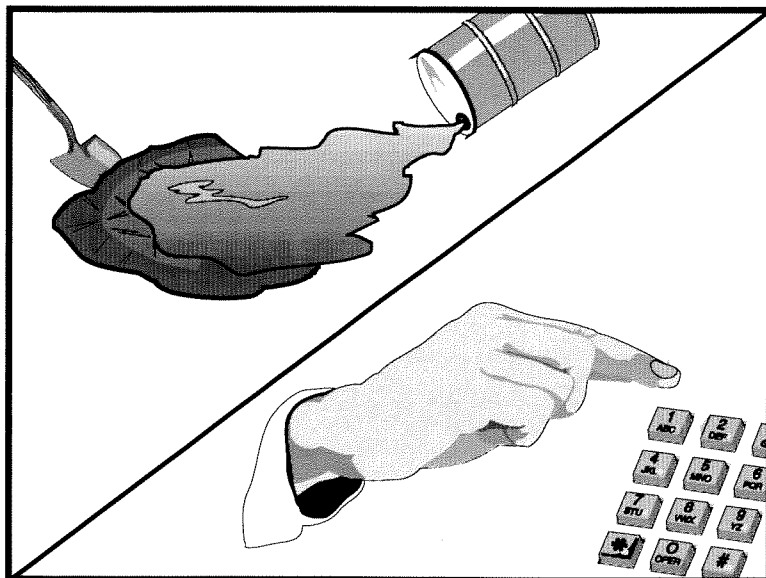
- During the rainy season, treated wood shall be covered with plastic or comparable material at all times.
- During the non-rainy season, treated wood shall be covered with plastic or comparable material and shall be placed on pallets prior to the onset of precipitation.

Protection of Active Stockpiles

Active stockpiles of the identified materials shall be protected further as follows:

- All stockpiles shall be covered, stabilized, or protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of “cold mix” shall be placed on and covered with plastic or comparable material prior to the onset of precipitation.

- Maintenance and Inspections ■ Repair and/or replace perimeter controls and covers as needed, or as directed by the RE, to keep them functioning properly. Sediment shall be removed when sediment accumulation reaches one-third (1/3) of the barrier height.



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

These procedures and practices are implemented to prevent and control spills in a manner that minimizes or prevents the discharge of spilled material to the drainage system or watercourses.

Appropriate Application

This best management practice (BMP) applies to all construction projects. Spill control procedures are implemented anytime chemicals and/or hazardous substances are stored. Substances may include, but are not limited to:

- Soil stabilizers/binders.
- Dust Palliatives.
- Herbicides.
- Growth inhibitors.
- Fertilizers.
- Deicing/anti-icing chemicals.
- Fuels.
- Lubricants.
- Other petroleum distillates.

To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110, 117, and 302, and sanitary and septic wastes shall be contained and cleaned up immediately.

Limitations ■ This BMP only applies to spills caused by the contractor.

- Procedures and practices presented in this BMP are general. Contractor shall identify appropriate practices for the specific materials used or stored on-site.

Standards and Specifications

- To the extent that it doesn't compromise clean up activities, spills shall be covered and protected from storm water run-on during rainfall.
- Spills shall not be buried or washed with water.
- Used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose shall be stored and disposed of in conformance with the special provisions.
- Water used for cleaning and decontamination shall not be allowed to enter storm drains or watercourses and shall be collected and disposed of in accordance with BMP WM-10, "Liquid Waste Management."
- Water overflow or minor water spillage shall be contained and shall not be allowed to discharge into drainage facilities or watercourses.
- Proper storage, clean-up and spill reporting instruction for hazardous materials stored or used on the project site shall be posted at all times in an open, conspicuous and accessible location.
- Waste storage areas shall be kept clean, well organized and equipped with ample clean-up supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers and liners shall be repaired or replaced as needed to maintain proper function.

Education

- Educate employees and subcontractors on what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce proper spill prevention and control measures.

Cleanup and Storage Procedures

■ Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc., which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Remove the absorbent materials promptly and dispose of properly.
- The practice commonly followed for a minor spill is:
 - Contain the spread of the spill.
 - Recover spilled materials.
 - Clean the contaminated area and/or properly dispose of contaminated materials.

■ Semi-Significant Spills

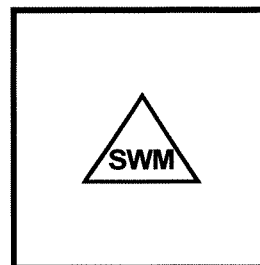
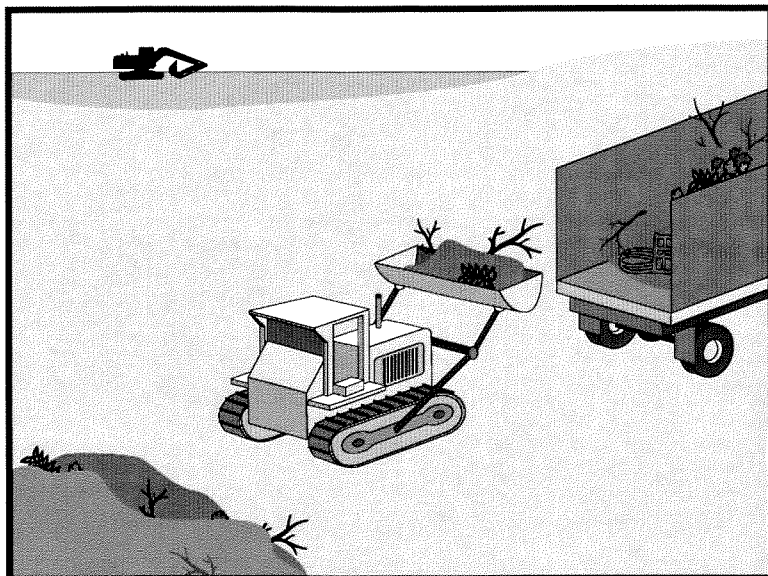
- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.
- Clean up spills immediately:
 - Notify the project foreman immediately. The foreman shall notify the Resident Engineer (RE).
 - Contain spread of the spill.
 - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
 - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
 - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

■ Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps shall be taken:
 - Notify the RE immediately and follow up with a written report.
 - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
 - Notify the Governor's Office of Emergency Services Warning Center, (805) 852-7550.
 - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110, 119, and 302, the contractor shall notify the National Response Center at (800) 424-8802.
 - Notification shall first be made by telephone and followed up with a written report.
 - The services of a spills contractor or a Haz-Mat team shall be obtained immediately. Construction personnel shall not attempt to clean up the spill until the appropriate and qualified staff have arrived at the job site.
 - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, RWQCB, etc.

Maintenance and Inspection

- Verify weekly that spill control clean up materials are located near material storage, unloading, and use areas.
- Update spill prevention and control plans and stock appropriate clean-up materials whenever changes occur in the types of chemicals used or stored onsite.



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose Solid waste management procedures and practices are designed to minimize or eliminate the discharge of pollutants to the drainage system or to watercourses as a result of the creation, stockpiling, or removal of construction site wastes.

Appropriate Applications Solid waste management procedures and practices are implemented on all construction projects that generate solid wastes.

Solid wastes include but are not limited to:

- Construction wastes including brick, mortar, timber, steel and metal scraps, sawdust, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials.
- Highway planting wastes, including vegetative material, plant containers, and packaging materials.
- Litter, including food containers, beverage cans, coffee cups, paper bags, plastic wrappers, and smoking materials, including litter generated by the public.

Limitations ■ Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Standards and Specifications *Education*

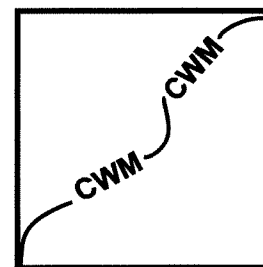
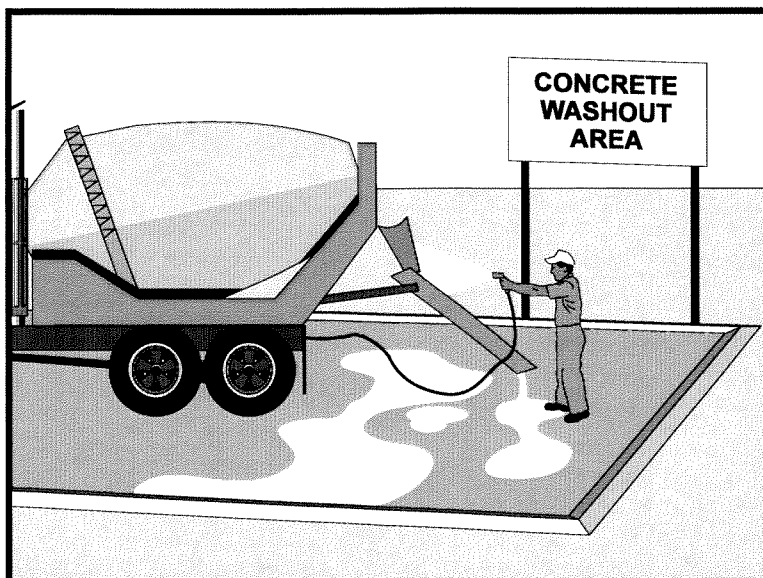
- The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce proper solid waste procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Wherever possible, minimize production of solid waste materials.

Collection, Storage, and Disposal

- Dumpsters of sufficient size and number shall be provided to contain the solid waste generated by the project and properly serviced.
- Littering on the project site shall be prohibited.
- To prevent clogging of the storm drainage system litter and debris removal from drainage grates, trash racks, and ditch lines shall be a priority.
- Trash receptacles shall be provided in the Contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Construction debris and litter from work areas within the construction limits of the project site shall be collected and placed in watertight dumpsters at least weekly regardless of whether the litter was generated by the Contractor, the public, or others. Collected litter and debris shall not be placed in or next to drain inlets, storm water drainage systems or watercourses.
- Full dumpsters shall be removed from the project site and the contents shall be disposed of outside the highway right-of-way in conformance with the provisions in the Standard Specifications Section 7-1.13.
- Litter stored in collection areas and containers shall be handled and disposed of by trash hauling contractors.
- Construction debris and waste shall be removed from the site every two weeks or as directed by the RE.

- Construction material visible to the public shall be stored or stacked in an orderly manner to the satisfaction of the RE.
- Storm water run-on shall be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas shall be located at least 15 m (50 ft) from drainage facilities and watercourses and shall not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters shall be securely covered from wind and rain by covering the waste with tarps or plastic sheeting or protected in conformance with the applicable Disturbed Soil Area protection section.
- Dumpster washout on the project site is not allowed.
- Notify trash hauling contractors that only watertight dumpsters are acceptable for use on-site.
- Plan for additional containers during the demolition phase of construction.
- Plan for more frequent pickup during the demolition phase of construction.
- Construction waste shall be stored in a designated area approved by the RE.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Keep the site clean of litter debris.
- Make sure that toxic liquid wastes (e.g., used oils, solvents, and paints) and chemicals (e.g., acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Dispose of non-hazardous waste in accordance with Standard Specification 7-1.13, Disposal of Material Outside the Highway Right of Way.
- For disposal of hazardous waste, see BMP WM-6, "Hazardous Waste Management." Have hazardous waste hauled to an appropriate disposal and/or recycling facility.
- Salvage or recycle useful vegetation debris, packaging and/or surplus building materials when practical. For example, trees and shrubs from land clearing can be converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

- Maintenance and Inspection
- The WPCM shall monitor onsite solid waste storage and disposal procedures.
 - Police site for litter and debris.



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

These are procedures and practices that are designed to minimize or eliminate the discharge of concrete waste materials to the storm drain systems or watercourses.

Appropriate Applications

- Concrete waste management procedures and practices are implemented on construction projects where concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Where slurries containing portland cement concrete (PCC) or asphalt concrete (AC) are generated, such as from sawcutting, coring, grinding, grooving, and hydro-concrete demolition.
- Where concrete trucks and other concrete-coated equipment are washed on site, when approved by the Resident Engineer (RE). See also NS-8, "Vehicle and Equipment Cleaning."
- Where mortar-mixing stations exist.

Limitations

- None identified.

Standards and Specifications

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.
- The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce concrete waste management procedures.

Concrete Demolition Wastes

- Stockpile concrete demolition wastes in accordance with BMP WM-3, "Stockpile Management."
- Disposal of hardened PCC and AC waste shall be in conformance with

Standard Specifications Section 7-1.13 or 15-3.02.

Concrete Slurry Waste Management and Disposal

- PCC and AC waste shall not be allowed to enter storm drainage systems or watercourses.
- A sign shall be installed adjacent to each temporary concrete washout facility to inform concrete equipment operators to utilize the proper facilities as shown on Page 7.
- A foreman and/or construction supervisor shall monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.
- Residue from saw cutting, coring and grinding operations shall be picked up by means of a vacuum device. Residue shall not be allowed to flow across the pavement and shall not be left on the surface of the pavement. See also BMP NS-3, "Paving and Grinding Operations."
- Vacuumed slurry residue shall be disposed in accordance with BMP WM-5, "Solid Waste Management" and Standard Specifications Section 7-1.13. Slurry residue shall be temporarily stored in a facility as described in "Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures" below), or within an impermeable containment vessel or bin approved by the Engineer.
- Collect and dispose of all residues from grooving and grinding operations in accordance with Standard Specifications Section 7-1.13, 42-1.02 and 42-2.02.

Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures

- Temporary concrete washout facilities shall be located a minimum of 15 m (50 ft) from storm drain inlets, open drainage facilities, and watercourses, unless determined infeasible by the RE. Each facility shall be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign shall be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities. The sign shall be installed as shown on the plans and in conformance with the provisions in Standard Specifications Section 56-2, Roadside Signs.
- Temporary concrete washout facilities shall be constructed above grade or below grade at the option of the Contractor. Temporary concrete washout facilities shall be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.
- Temporary washout facilities shall have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete

materials generated during washout procedures.

- Perform washout of concrete mixers, delivery trucks, and other delivery systems in designated areas only.
- Wash concrete only from mixer chutes into approved concrete washout facility. Washout may be collected in an impermeable bag or other impermeable containment devices for disposal.
- Pump excess concrete in concrete pump bin back into concrete mixer truck.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete shall be broken up, removed, and disposed of in conformance with the provisions in Standard Specifications Section 7-1.13 or 15-3.02.

Temporary Concrete Washout Facility Type "Above Grade"

- Temporary concrete washout facility Type "Above Grade" shall be constructed as shown on Page 6 or 7, with a recommended minimum length and minimum width of 3 m (10 ft), but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations. The length and width of a facility may be increased, at the Contractor's expense, upon approval from the RE.
- Straw bales, wood stakes, and sandbag materials shall conform to the provisions in BMP SC-9, "Straw Bale Barrier."
- Plastic lining material shall be a minimum of 10-mil polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material. Liner seams shall be installed in accordance with manufacturers' recommendations.
- Portable delineators shall conform to the provisions in Standard Specifications Section 12-3.04, "Portable Delineators." The delineator bases shall be cemented to the pavement in the same manner as provided for cementing pavement markers to pavement in Standard Specifications Section 85-1.06, "Placement." Portable delineators shall be applied only to a clean, dry surface.

Temporary Concrete Washout Facility (Type Below Grade)

- Temporary concrete washout facility Type "Below Grade" shall be constructed as shown on page 6, with a recommended minimum length and minimum width of 3m (10 ft). The quantity and volume shall be sufficient to contain all liquid and concrete waste generated by washout operations. The length and width of a facility may be increased, at the Contractor's expense,

upon approval of the RE. Lath and flagging shall be commercial type.

- Plastic lining material shall be a minimum of 10-mil polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material. Liner seams shall be installed in accordance with manufacturers' recommendations.
- The soil base shall be prepared free of rocks or other debris that may cause tears or holes in the plastic lining material.

Removal of Temporary Concrete Washout Facilities

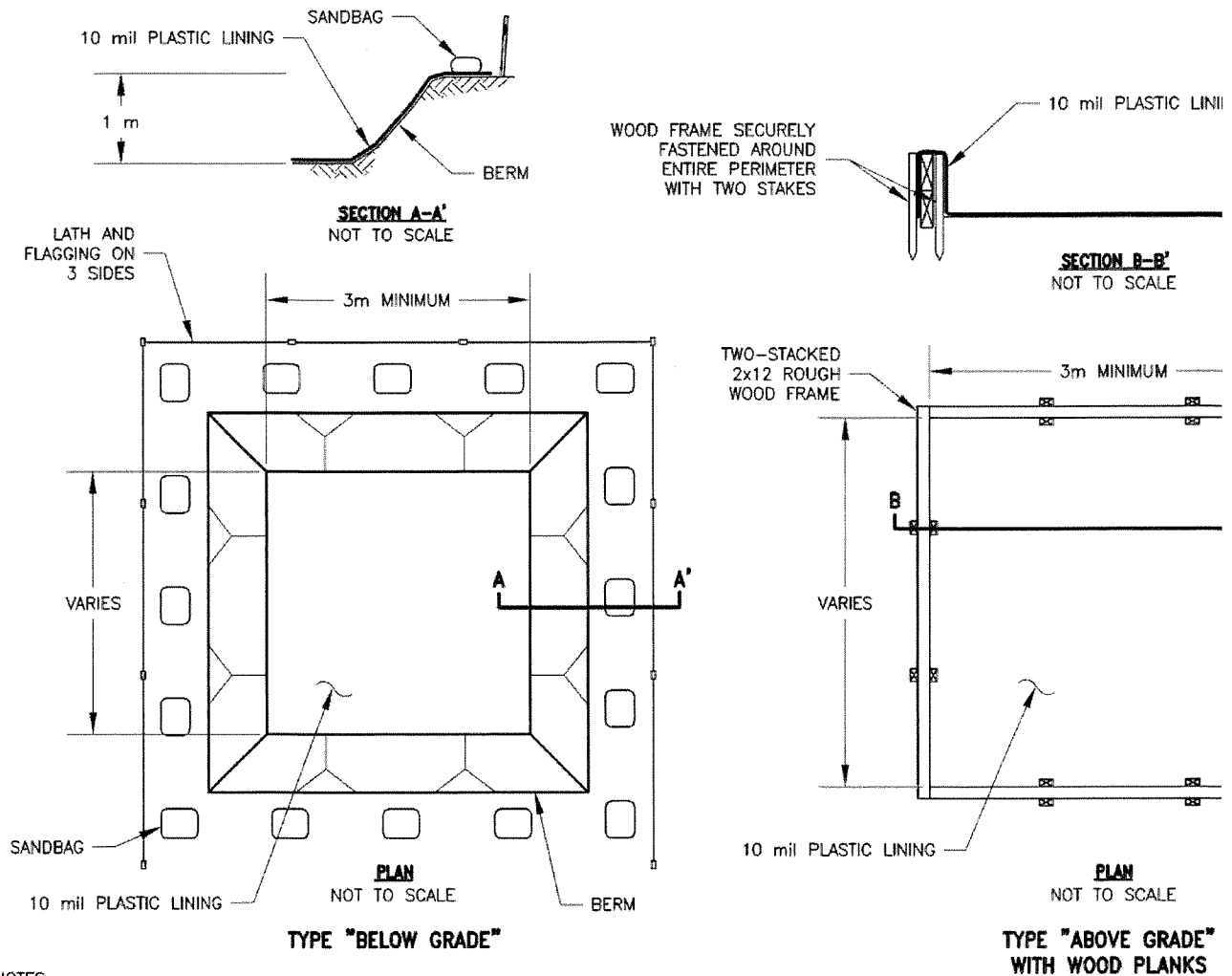
- When temporary concrete washout facilities are no longer required for the work, as determined by the RE, the hardened concrete shall be removed and disposed of in conformance with the provisions in Standard Specifications Section 7-1.13 or 15-3.02. Disposal of PCC dried residues, slurries or liquid waste shall be disposed of outside the highway right-of-way in conformance with provisions of Standard Specifications Section 7-1-13. Materials used to construct temporary concrete washout facilities shall become the property of the Contractor, shall be removed from the site of the work, and shall be disposed of outside the highway right-of-way in conformance with the provisions of the Standard Specifications, Section 7-1.13.
- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities shall be backfilled and repaired in conformance with the provisions in Standard Specifications Section 15-1.02, "Preservation of Property."

Maintenance and Inspection

- The Contractor's Water Pollution Control Manager (WPCM) shall monitor on site concrete waste storage and disposal procedures at least weekly or as directed by the RE.
- The WPCM shall monitor concrete working tasks, such as saw cutting, coring, grinding and grooving daily to ensure proper methods are employed or as directed by the RE.
- Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 100 mm (4 inches) for above grade facilities and 300 mm (12 inches) for below grade facilities. Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials shall be removed and disposed of in conformance with the provisions in Standard Specifications Section 7-1.13 or 15-3.02.
- Existing facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.
- Temporary concrete washout facilities shall be inspected for damage (i.e.

tears in polyethylene liner, missing sandbags, etc.). Damaged facilities shall be repaired.

Concrete Waste Management

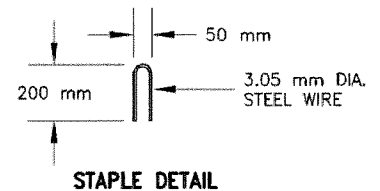
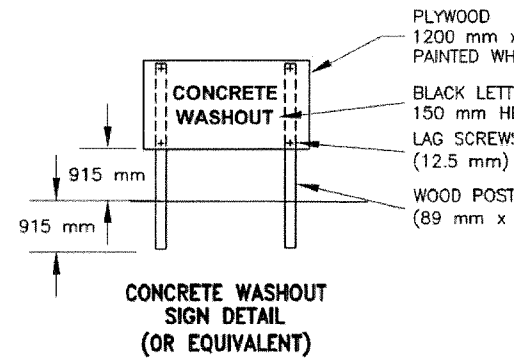
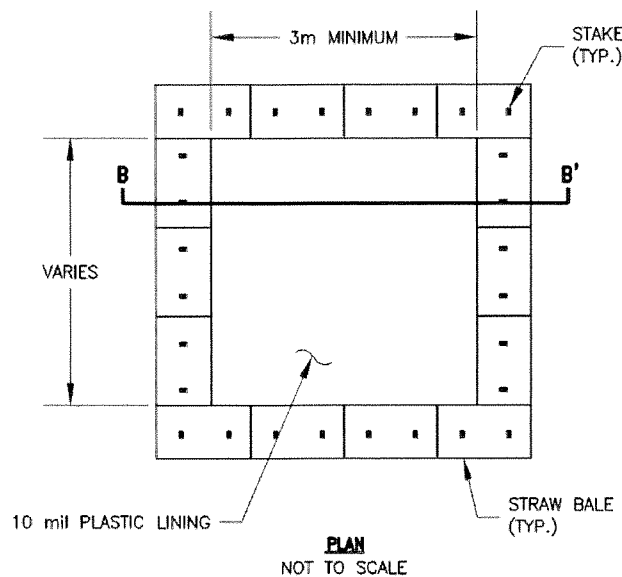
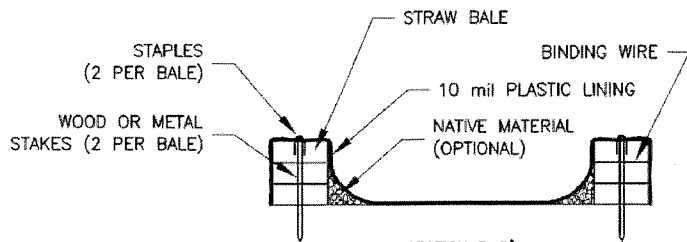


NOTES:

1. ACTUAL LAYOUT DETERMINED IN THE FIELD.
2. THE CONCRETE WASHOUT SIGN (SEE PAGE 6) SHALL BE INSTALLED WITHIN 10 m OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



Concrete Waste Management

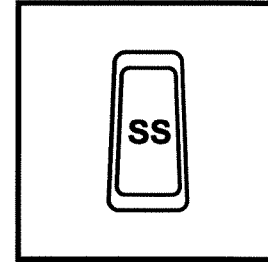
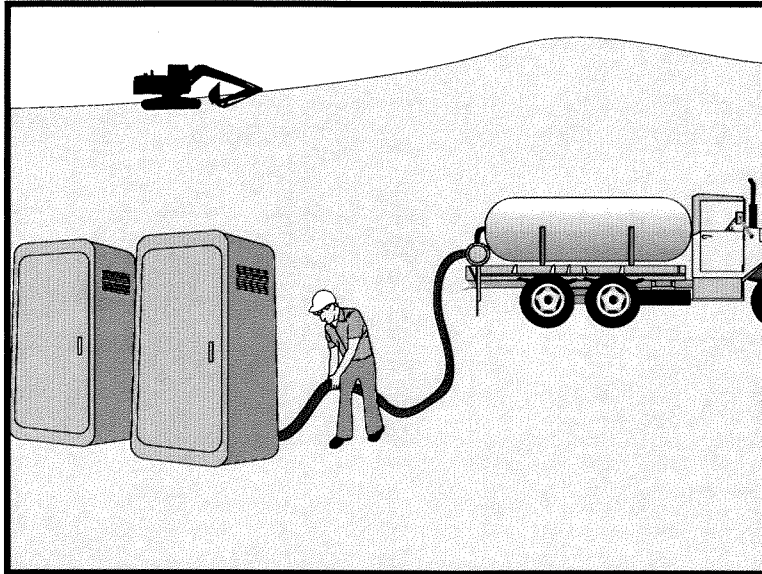


NOTES:

1. ACTUAL LAYOUT DETERMINED IN THE FIELD.
2. THE CONCRETE WASHOUT SIGN (SEE FIG. 4-15) SHALL BE INSTALLED WITHIN 10 m OF THE TEMPORARY CONCRETE WASHOUT FACILITY.

CALTRANS/FIG4-14.DWG SAC B-14-02





Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose Procedures and practices to minimize or eliminate the discharge of construction site sanitary/septic waste materials to the storm drain system or to watercourses.

Appropriate Applications Sanitary/septic waste management practices are implemented on all construction sites that use temporary or portable sanitary/septic waste systems.

Limitations ■ None identified.

Standards and Specifications

Education

- Educate employees, subcontractors, and suppliers on sanitary/septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary/septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary/septic waste.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

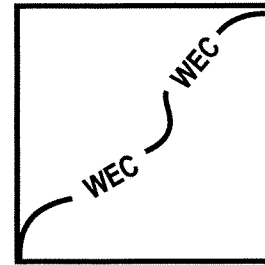
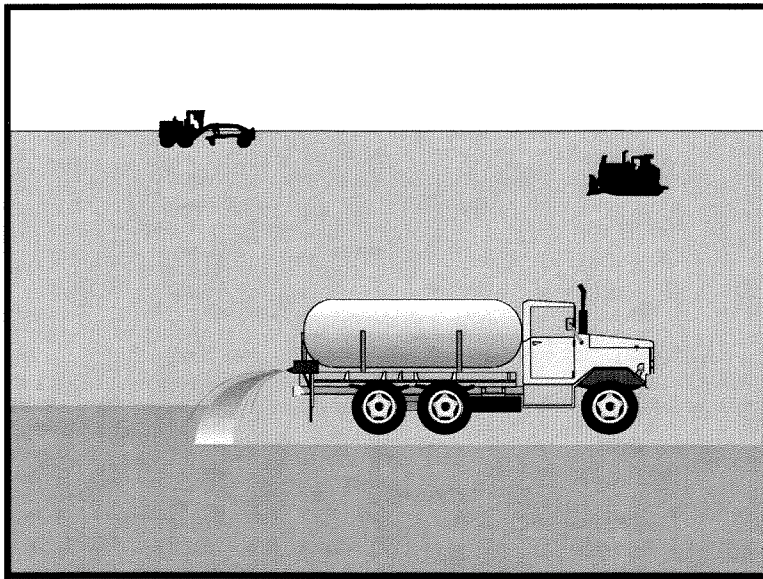
Storage and Disposal Procedures

- Temporary sanitary facilities shall be located away from drainage facilities, watercourses, and from traffic circulation. When subjected to high winds or risk.

- Wastewater shall not be discharged or buried within the highway right-of-way.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, shall comply with the local health agency, city, county, and sewer district requirements.
- If using an on site disposal system, such as a septic system, comply with local health agency requirements.
- Properly connect temporary sanitary facilities that discharge to the sanitary sewer system to avoid illicit discharges.
- Ensure that sanitary/septic facilities are maintained in good working order by a licensed service.
- Use only reputable, licensed sanitary/septic waste haulers.

Maintenance and Inspection

- The Contractor's Water Pollution Control Manager (WPCM) shall monitor onsite sanitary/septic waste storage and disposal procedures at least weekly.



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Wind erosion control consists of applying water and/or other dust palliatives as necessary to prevent or alleviate erosion by the forces of wind. Dust control shall be applied in accordance with Caltrans standard practices. Covering of small stockpiles or areas is an alternative to applying water or other dust palliatives.

Appropriate Applications Limitations

- This practice is implemented on all exposed soils subject to wind erosion.
- Effectiveness depends on soil, temperature, humidity and wind velocity.

Standards and Specifications

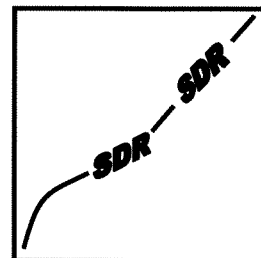
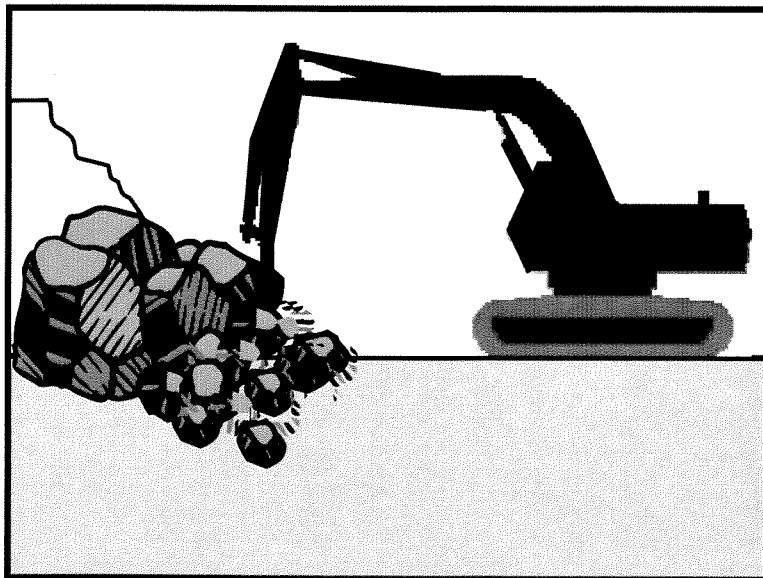
- Water shall be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment shall be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit shall be available at all times to apply water or dust palliative to the project.
- If reclaimed water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality Control Board requirements. Non-potable water shall not be conveyed in tanks or drain pipes that will be used to convey potable water and there shall be no connection between potable and non-potable supplies. Non-potable tanks, pipes and other conveyances shall be marked "NON-POTABLE WATER - DO NOT DRINK."
- Materials applied as temporary soil stabilizers and soil binders will also provide wind erosion control benefits.

Maintenance and Inspection

- Check areas that have been protected to ensure coverage.

Structure Demolition/Removal Over or Adjacent to Water

NS-15



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Procedures to protect water bodies from debris and wastes associated with structure demolition or removal over or adjacent to watercourses.

Appropriate Applications

Full bridge demolition and removal, partial bridge removal (e.g., barrier rail, edge of deck) associated with bridge widening projects, concrete channel removal, or any other structure removal that could potentially affect water quality.

Limitations

- Specific permit requirements may be included in the contract documents.

Standards and Specifications

- Do not allow demolished material to enter waterway.
- Refer to BMP NS-5, "Clear Water Diversion" to direct water away from work areas.
- Use attachments on construction equipment such as backhoes to catch debris from small demolition operations.
- Use covers or platforms to collect debris.
- Platforms and covers are to be approved by the RE.
- Stockpile accumulated debris and waste generated during demolition away from watercourses and in accordance with BMP WM-3, "Stockpile Management."
- Ensure safe passage of wildlife, as necessary.
- Discharges to waterways shall be reported to the RE immediately upon discovery. A written discharge notification must follow within 7 days.

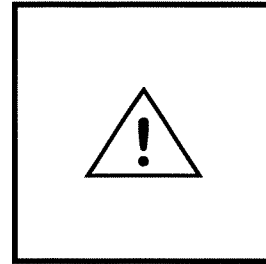
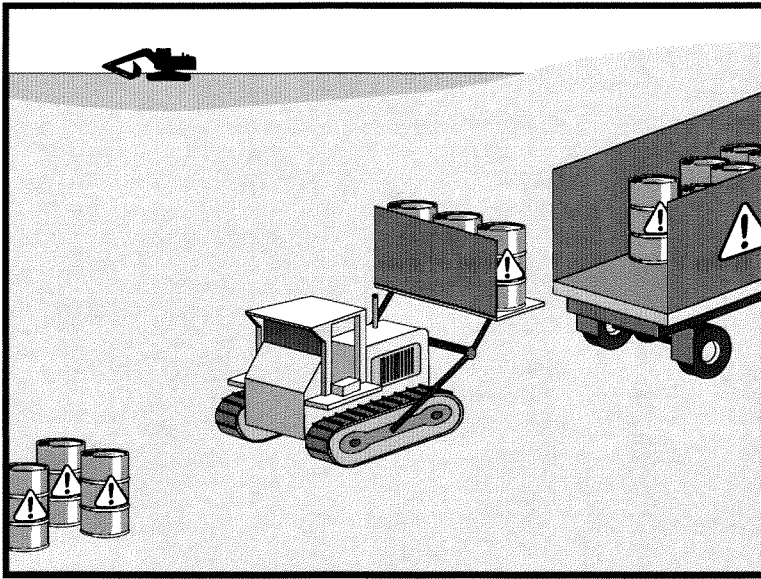


Structure Demolition/Removal Over or Adjacent to Water

NS-15

- For structures containing hazardous materials (e.g., lead paint or asbestos) refer to BMP WM-6, "Hazardous Waste Management." For demolition work involving soil excavation around lead-painted structures, refer to BMP WM-7, "Contaminated Soil Management."
- Maintenance and Inspection
- Contractor must inspect demolition areas over or near adjacent watercourses on a daily basis.
 - Any debris-catching devices shall be emptied regularly. Collected debris shall be removed and stored away from the watercourse and protected from run-on and runoff.





Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose These are procedures and practices to minimize or eliminate the discharge of pollutants from construction site hazardous waste to the storm drain systems or to watercourses.

Appropriate Applications

- This best management practice (BMP) applies to all construction projects.
- Hazardous waste management practices are implemented on construction projects that generate waste from the use of:
 - Petroleum Products,
 - Asphalt Products,
 - Concrete Curing Compounds,
 - Pesticides,
 - Acids,
 - Paints,
 - Stains,
 - Solvents,
 - Wood Preservatives,
 - Roofing Tar, or
 - Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302.

- Limitations**
- Nothing in this BMP relieves the Contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
 - This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to BMP WM-7, "Contaminated Soil Management," and the project special provisions.

Standards and Specifications ***Education***

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.

Storage Procedures

- Wastes shall be stored in sealed containers constructed of a suitable material and shall be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172, 173, 178, and 179.
- All hazardous waste shall be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers shall be stored in temporary containment facilities that shall comply with the following requirements:
 - Temporary containment facility shall provide for a spill containment volume able to contain precipitation from a 24-hour, 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.

- Temporary containment facility shall be impervious to the materials stored there for a minimum contact time of 72 hours.
 - Temporary containment facilities shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks accumulated rainwater and spills shall be placed into drums after each rainfall. These liquids shall be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids shall be sent to an approved disposal site.
 - Sufficient separation shall be provided between stored containers to allow for spill cleanup and emergency response access.
 - Incompatible materials, such as chlorine and ammonia, shall not be stored in the same temporary containment facility.
 - Throughout the rainy season, temporary containment facilities shall be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs. A storage facility having a solid cover and sides is preferred to a temporary tarp. Storage facilities shall be equipped with adequate ventilation.
- Drums shall not be overfilled and wastes shall not be mixed.
 - Unless watertight, containers of dry waste shall be stored on pallets.
 - Paint brushes and equipment for water and oil based paints shall be cleaned within a contained area and shall not be allowed to contaminate site soils, watercourses or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused shall be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths shall be disposed of as solid waste.
 - Ensure that adequate hazardous waste storage volume is available.
 - Ensure that hazardous waste collection containers are conveniently located.
 - Designate hazardous waste storage areas on site away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.
 - Minimize production or generation of hazardous materials and hazardous waste on the job site.
 - Use containment berms in fueling and maintenance areas and where the potential for spills is high.

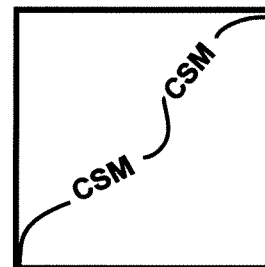
- Segregate potentially hazardous waste from non-hazardous construction site debris.
- Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.
- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Do not mix wastes.

Disposal Procedures

- Waste shall be disposed of outside the highway right-of-way within 90 days of being generated, or as directed by the Resident Engineer (RE). In no case shall hazardous waste storage exceed requirements in Title 22 CCR, Section 66262.34.
- Waste shall be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A Department of Health Services (DHS) certified laboratory shall sample waste and classify it to determine the appropriate disposal facility.
- Make sure that toxic liquid wastes (e.g., used oils, solvents, and paints) and chemicals (e.g., acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for solid waste construction debris.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Recycle any useful material such as used oil or water-based paint when practical.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

Maintenance and Inspection

- A foreman and/or construction supervisor shall monitor on-site hazardous waste storage and disposal procedures.
- Waste storage areas shall be kept clean, well organized, and equipped with ample clean-up supplies as appropriate for the materials being stored.
- Storage areas shall be inspected in conformance with the provisions in the contract documents.
- Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.
- Hazardous spills shall be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.
- The National Response Center, at (800) 424-8802, shall be notified of spills of Federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302.
- Copy of the hazardous waste manifests shall be provided to the RE.



Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose These are procedures and practices to minimize or eliminate the discharges of pollutants to the drainage system or to watercourses from contaminated soil.

- Appropriate Applications**
- Contaminated soil management is implemented on construction projects in highly urbanized or industrial areas where soil contamination may have occurred due to spills, illicit discharges, and leaks from underground storage tanks.
 - It may also apply to highway widening projects in older areas where median and shoulder soils may have been contaminated by aerially deposited lead (ADL).

- Limitations**
- The procedures and practices presented in this best management practice (BMP) are general. The contractor shall identify appropriate practices and procedures for the specific contaminants known to exist or discovered on site.

Standards and Specifications *Identifying Contaminated Areas*

- Contaminated soils are often identified during project planning and development with known locations identified in the plans and specifications. The contractor shall review applicable reports and investigate appropriate call-outs in the plans and specifications.
- The contractor may further identify contaminated soils by investigating:
 - Past site uses and activities.
 - Detected or undetected spills and leaks.
 - Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements.

- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris. Test suspected soils at a certified laboratory.

Education

- Prior to performing any excavation work at the locations containing material classified as hazardous, employees and subcontractors shall complete a safety training program which meets 29 CFR 1910.120 and 8 CCR 5192 covering the potential hazards as identified.
- Educate employees and subcontractors in identification of contaminated soil and on contaminated soil handling and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

Handling Procedures for Material with Aerially Deposited Lead (ADL)

- Materials from areas designated as containing (ADL) may, if allowed by the contract special provisions, be excavated, transported, and used in the construction of embankments and/or backfill.
- Excavation, transportation, and placement operations shall result in no visible dust.
- Use caution to prevent spillage of lead containing material during transport.
- Monitor the air quality during excavation of soils contaminated with lead.

Handling Procedures for Contaminated Soils

- To minimize on-site storage, contaminated soil shall be disposed of properly in accordance with all applicable regulations. All hazardous waste storage will comply with the requirements in Title 22, CCR, Sections 6626.250 to 66265.260.
- Test suspected soils at a DHS approved certified laboratory.
- If the soil is contaminated, work with the local regulatory agencies to develop options for treatment and/or disposal.
- Avoid temporary stockpiling of contaminated soils or hazardous material.
- If temporary stockpiling is necessary:
 - (1) Cover the stockpile with plastic sheeting or tarps.
 - (2) Install a berm around the stockpile to prevent runoff from leaving the area.
 - (3) Do not stockpile in or near storm drains or watercourses.

- Contaminated material and hazardous material on exteriors of transport vehicles shall be removed and placed either into the current transport vehicle or the excavation prior to the vehicle leaving the exclusion zone.
- Monitor the air quality continuously during excavation operations at all locations containing hazardous material.
- Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the contaminated material and the hazardous material.
- Collect water from decontamination procedures and treat and/or dispose of it at an appropriate disposal site.
- Collect non-reusable protective equipment, once used by any personnel, and dispose of at an appropriate disposal site.
- Install temporary security fence to surround and secure the exclusion zone. Remove fencing when no longer needed.
- Excavation, transport, and disposal of contaminated material and hazardous material shall be in accordance with the rules and regulations of the following agencies (the specifications of these agencies supersede the procedures outlined in this BMP):
 - United States Department of Transportation (USDOT).
 - United States Environmental Protection Agency (USEPA).
 - California Environmental Protection Agency (CAL-EPA).
 - California Division of Occupation Safety and Health Administration (CAL-OSHA).
 - Local regulatory agencies.

Procedures for Underground Storage Tank Removals

- Prior to commencing tank removal operations, obtain the required underground storage tank removal permits and approval from the federal, state, and local agencies, which have jurisdiction over such work.
- Arrange to have tested, as directed by the Resident Engineer (RE), any liquid or sludge found in the underground tank prior to its removal to determine if it contains hazardous substances.
- Following the tank removal, take soil samples beneath the excavated tank and perform analysis as required by the local agency representative(s).

- The underground storage tank, any liquid and/or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal shall be transported to disposal facilities permitted to accept such waste.

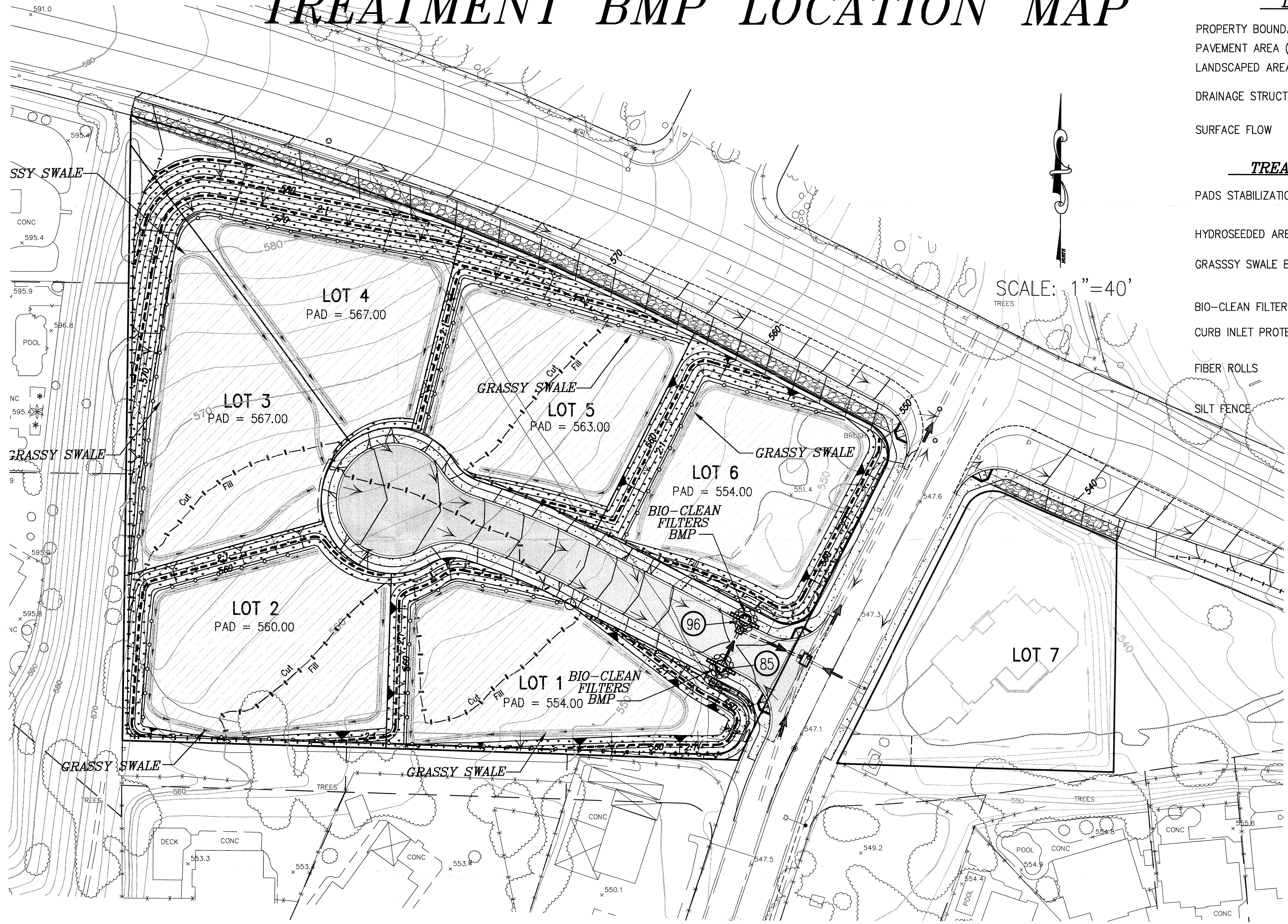
Water Control

- Take all necessary precautions and preventive measures to prevent the flow of water, including ground water, from mixing with hazardous substances or underground storage tank excavations. Such preventative measures may consist of, but are not limited to: berms, cofferdams, grout curtains, freeze walls, and seal course concrete or any combination thereof.
- If water does enter an excavation and becomes contaminated, such water, when necessary to proceed with the work, shall be dewatered consistent with BMP NS-2, "Dewatering Operations."

Maintenance and Inspection

- The Contractor's Water Pollution Control Manager, foreman, and/or construction supervisor shall monitor on-site contaminated soil storage and disposal procedures.
- Monitor air quality continuously during excavation operations at all locations containing hazardous material.
- Coordinate contaminated soils and hazardous substances/waste management with the appropriate federal, state, and local agencies.
- Inspect hazardous waste receptacles and areas regularly.

TREATMENT BMP LOCATION MAP

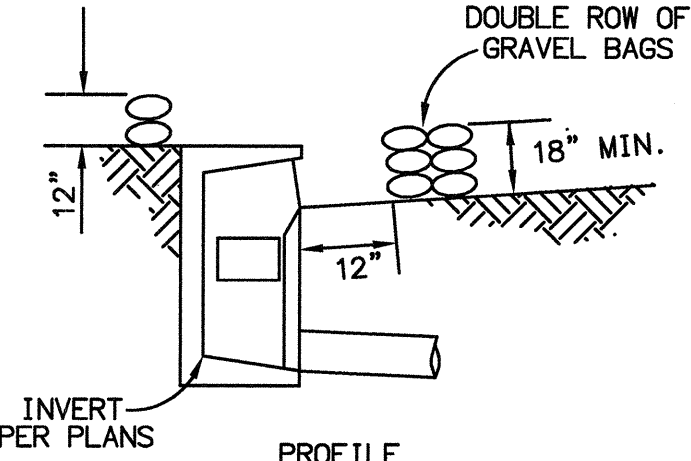
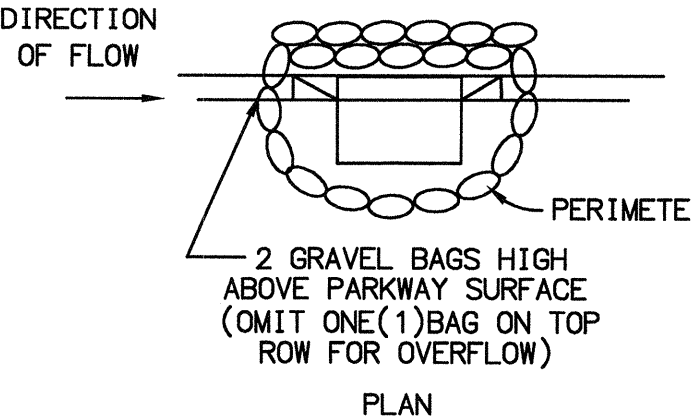
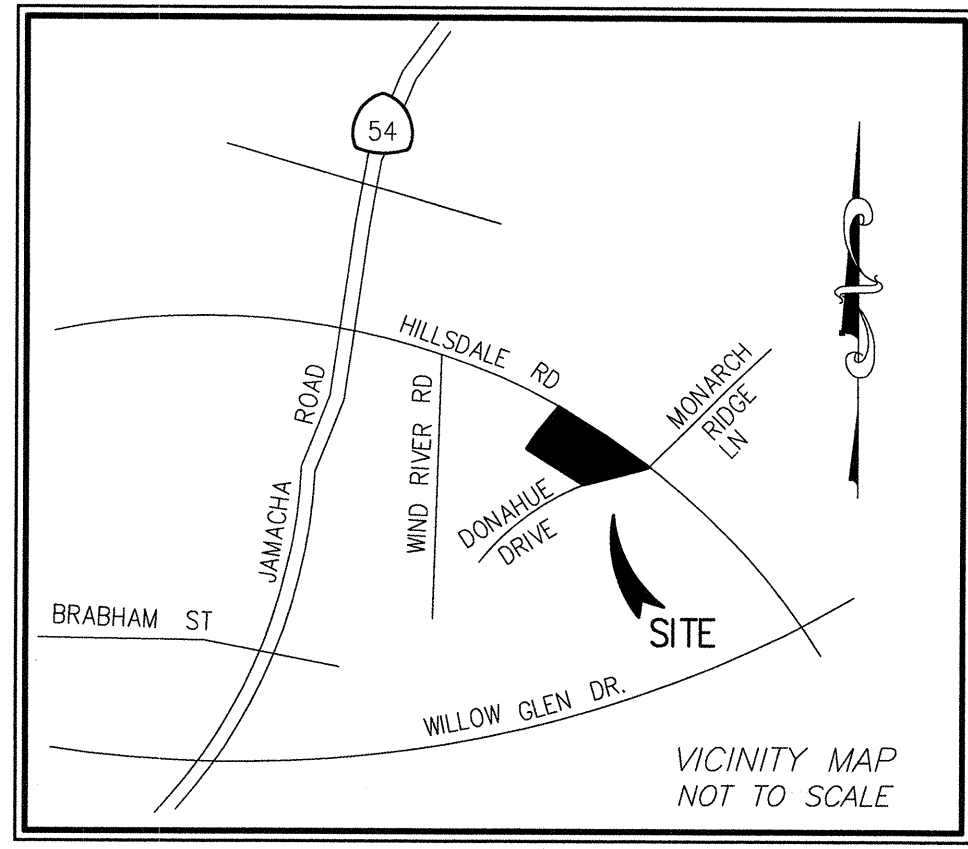


LEGEND

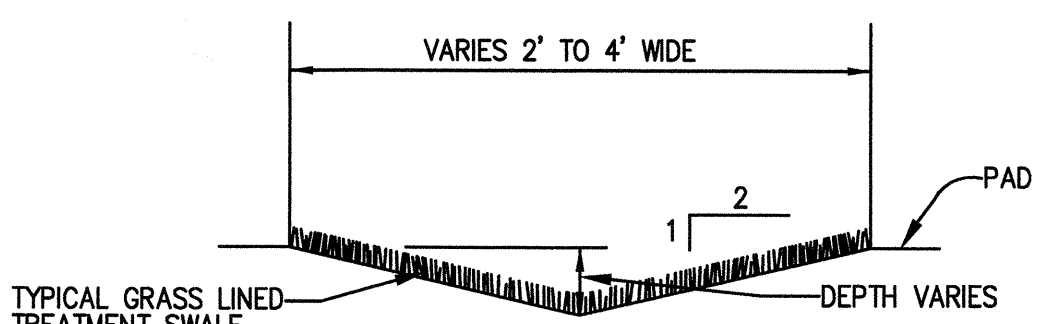
PROPERTY BOUNDARY
PAVEMENT AREA (CONC.-ASPH.)
LANDSCAPED AREA
DRAINAGE STRUCTURE FLOW
SURFACE FLOW

TREATMENT BMP's

PADS STABILIZATION OR BFM
HYDROSEEDING AREA
GRASSY SWALE BMP
BIO-CLEAN FILTER INSERTS
CURB INLET PROTECTION
FIBER ROLLS
SILT FENCE



INLET PROTECTION
N.T.S.



TYPICAL LOT TREATMENT
GRASSY SWALE BMP
NOT TO SCALE

TRIBUTORY AREAS FOR EACH UNIT			
OUTFALL NODE	ACRE	Q ₁₀ (CFS)	Q ₅ (CFS)
86	1.89	0.99	0.04
96	2.82	6.04	0.18

TIME OF INSTALLATION:
IT IS THE INTENT THAT THE HYDROSEED MIX BE APPLIED NO SOONER THAN JUST BEFORE THE FIRST RAIN, IN NOVEMBER, AND NO LATER THAN JUST AFTER THE SECOND RAIN AFTER THE FIRST RAIN IN NOV.

K&S ENGINEERING
Planning Engineering Surveying
7801 Mission Center Court, Suite 100
San Diego Ca. 92108

ENGINEER OF WORK
KAMAL S. SWEIS RCE 48592 DATE



BENCH MARK

DESCRIPTION: PHR 0004
LOCATION: SOUTHWEST CORNER OF POST HILL ROAD & HIGHWAY 67.
RECORD FROM:
ELEVATION: 496.66 DATUM: NGVD29

PRIVATE CONTRACT

SHEET 1 COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS SHEETS 1

TREATMENT BMP LOCATION MAP

SWMP MAP
DONAHUE STREET

Approved: COUNTY ENGINEER
By: _____
Date: _____

Engineer of work: Kamal S. Sweis
R.C.E. 48592
Grading Permit No. _____
Date: _____

FILE No.